

SYSTEMS INTEGRATION

TRENDS & FORECASTS

1992 - 1997

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Systems Integration Program
(SISIP)

Systems Integration Trends and Forecasts
1992-1997

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Abstract

The market for systems integration services and products continues to grow, but at a slower rate than last year. Although the current sluggish economy has had a dampening effect on the growth rate of this delivery mode, it remains an attractive market. Systems integration is now a broadly recognized and accepted delivery channel for all major information services vendors. Commercial SI client expenditures are now more than twice that of federal expenditures.

This report analyzes the U.S. systems integration (SI) market as it existed in 1991, examines issues and trends that appear to affect the market, and forecasts market growth through 1997. The report identifies and analyzes SI market activities and forces, types of opportunities, and leading vendors by vertical market segment, market share of leading vendors, and SI components. The components include equipment, professional services, packaged software, and other services. Fifteen vertical markets are examined and important comparisons are made between the commercial and federal markets.

The report also presents and analyzes user/buyer issues and secondary market participants and presents vendor market strategies and recommendations. Comparisons with the *U.S. Systems Integration Market Forecast, 1991-1996* report are also included.

The report contains 210 pages and 110 exhibits.



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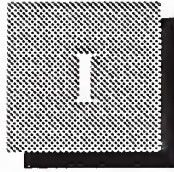
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Introduction

This report—*Systems Integration Trends and Forecasts, 1992-1997*—forms the foundation of INPUT's Systems Integration Program. This report updates and expands on the 1991-1996 market analysis report, *U.S. Systems Integration Market Forecast, 1991-1996*.

The report identifies market, vendor, and buyer issues, and discusses trends that affect vendors in or about to enter this market. The report analyzes both the commercial SI (CSI) and federal government SI (FSI) markets. INPUT also makes strategic recommendations for vendors.

The analysis also individually considers the prospects in 15 vertical industry markets. It discusses vendors active in each of the vertical markets and factors likely to affect market potential.

The objective of the Systems Integration Program is to assist INPUT's clients in planning how to:

- Formulate effective business development strategies
- Address the needs of commercial and federal clients
- Understand the competitive structure

A separate report, *Systems Integration Competitive Analysis*, examines the characteristics and strategies of the competitors, including profiles of leading SI vendors.

This report is based on interviews with systems integration (SI) clients and vendors and data from discussions with forecasters at the Department of Commerce. It draws upon data bases assembled by INPUT for the annual Information Services Industry Sector reports, INPUT's *Federal Systems Integration Market* report, and the Systems Integration Program.

The report also draws upon data included in INPUT's data base of systems integration projects, begun in 1988. By analyzing information in the data base, INPUT is able to identify opportunity and industry trends and understand changes that could affect marketing opportunities over the next several years.

A

Scope

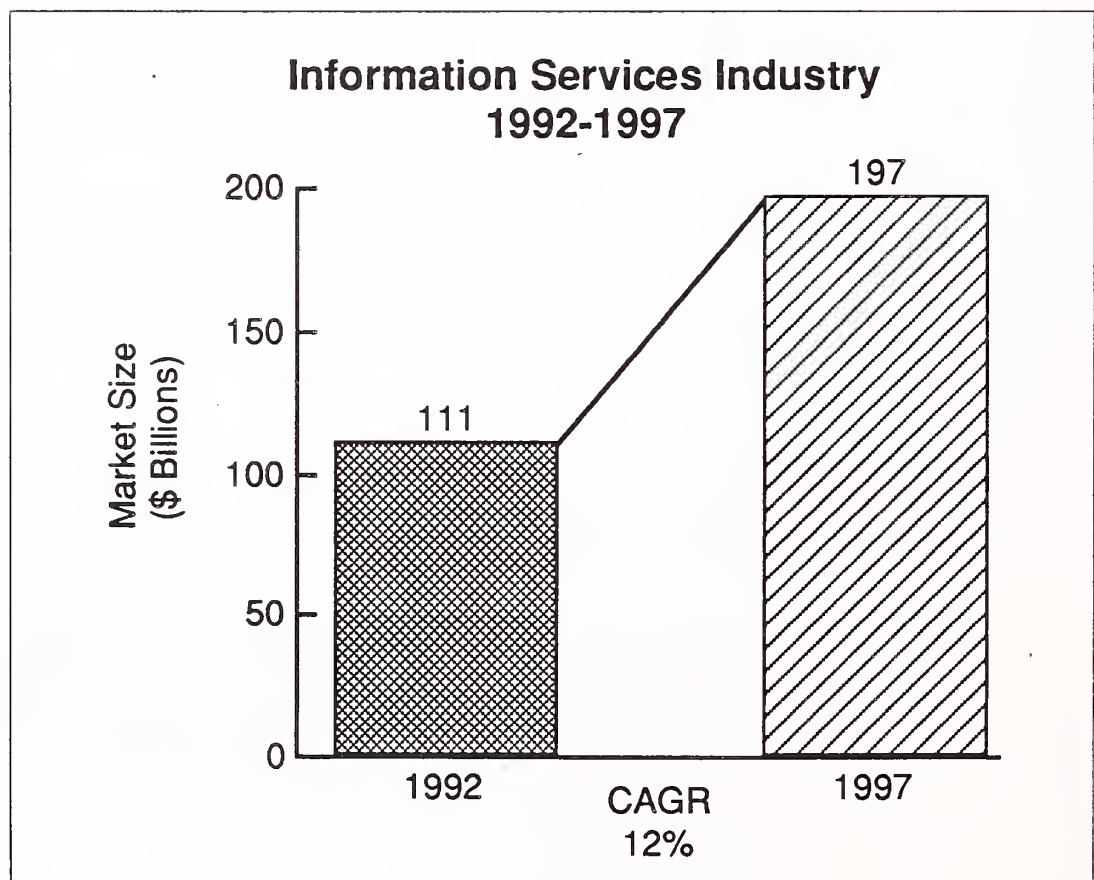
1. Purpose

The purpose of the Systems Integration Program is to provide insight into and understanding of the key issues, trends, opportunities, and driving forces shaping the U.S. systems integration market. Competitive information, market share, market size, growth rate, and forecast are provided.

2. Total Information Services Market

INPUT researches and studies the entire information services market. As shown in Exhibit I-1, INPUT expects the market to grow from \$111 billion in 1992 to \$197 billion in 1997, at a compound annual growth rate (CAGR) of 12%.

EXHIBIT I-1

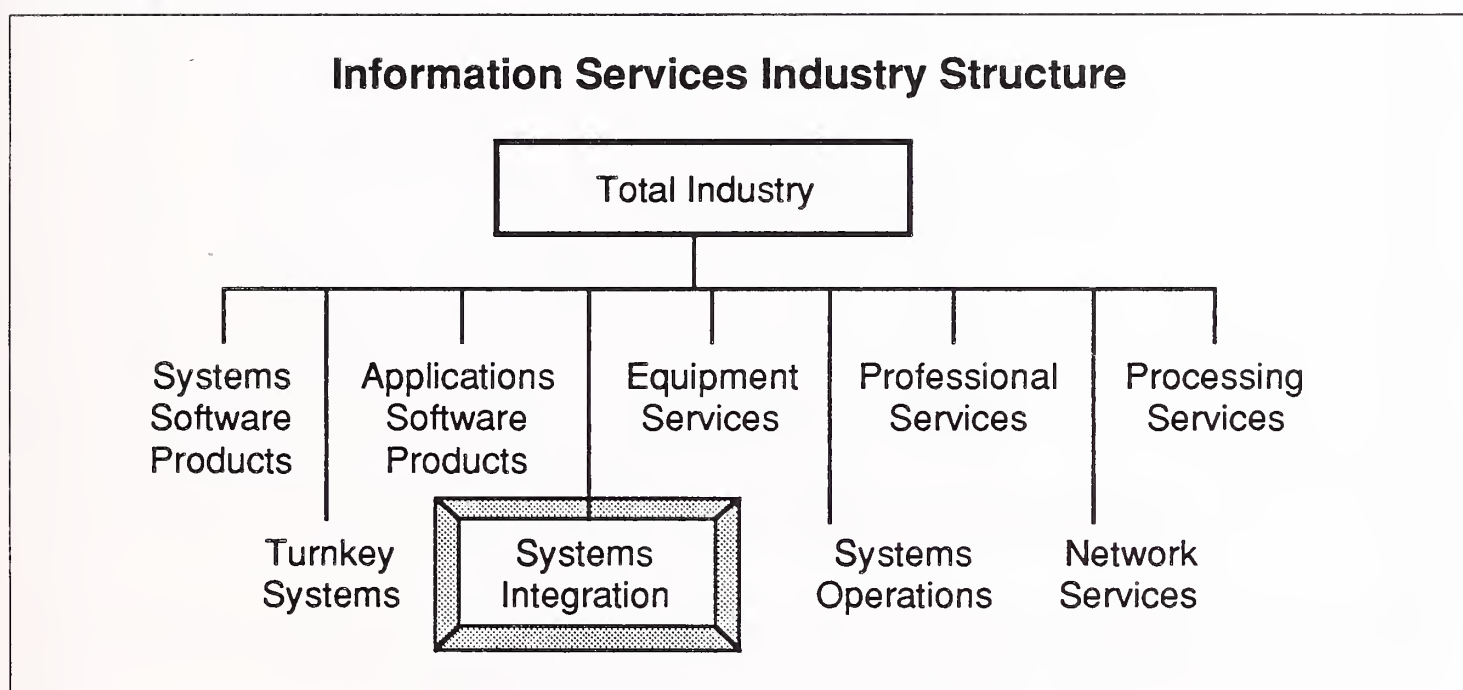


3. Delivery Modes

INPUT also segments the information services industry into nine delivery modes (see Exhibit I-2). This segmentation represents the way in which clients gain access to information services products and services. By analysis and reconciliation of these delivery modes, INPUT minimizes the possibility of multiple counting of customer expenditures.

Each of these delivery modes is the subject of a separate market analysis report and is consolidated into a total industry analysis and report. This report is devoted to the systems integration delivery mode.

EXHIBIT I-2



4. Geographic Coverage

The report addresses contracted systems integration activities of all vendors for U.S. business and government organizations. If international components are delivered as part of a U.S.-based project, those expenditures are included.

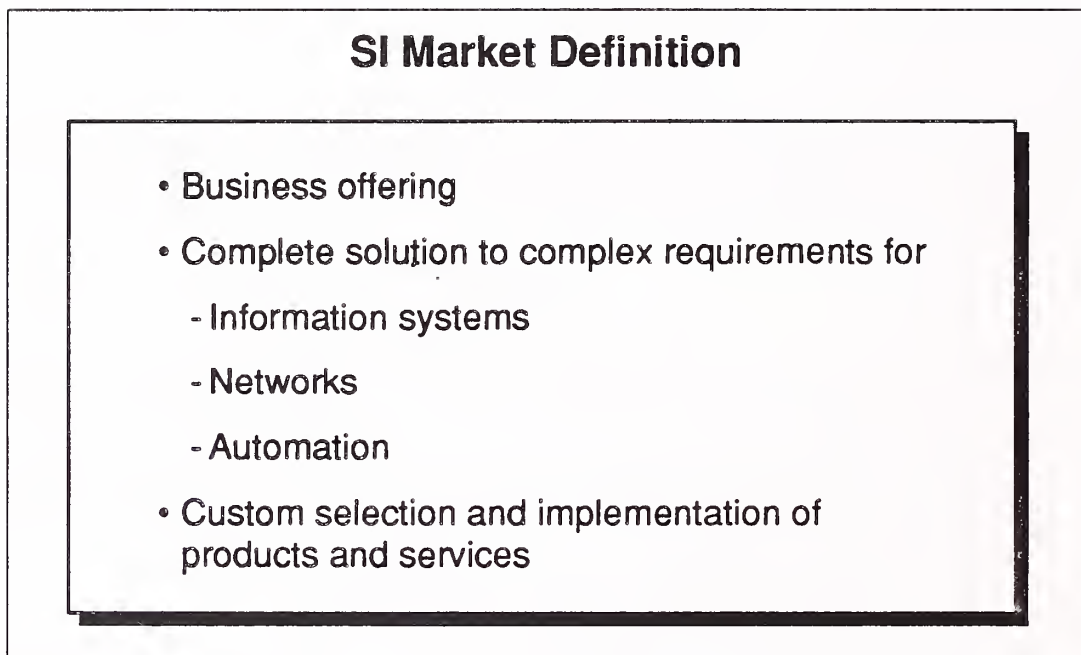
Estimates of current and future integration project spending use Department of Commerce industrial capital equipment investment data. The principal growth measures are increases in client SI contract spending. This avoids the potential for double counting that can occur when using reported vendor revenues.

5. Systems Integration Definition

INPUT's definition of systems integration is shown in Exhibit I-3. This definition is used for the report as well as the 1992 Systems Integration Program.

INPUT's definition emphasizes the provision of a complete solution to complex requirements and the custom selection and implementation of products and services.

EXHIBIT I-3



When vendor revenues are identified, INPUT will occasionally adjust the reported revenues to conform to this delivery mode definition.

Typically, a systems integrator has program management responsibility, which is overall management for delivery of the end product. Program management usually includes systems design and development and provision of all equipment, software, and communications. The integrator also coordinates teaming arrangements with outside suppliers for engineering/data processing/personnel resources, and the documentation/training/post-implementation support required by the client. The primary tasks are summarized in Exhibit I-4.

EXHIBIT I-4

Typical Tasks of SI Projects

- Total project management
- Process feasibility and trade-off studies
- Business process and systems design
- Selection/configuration of equipment and networks
- Selection of systems software
- Selection/development of applications software
- Change management
- Installation of equipment and software
- Testing and demonstration of system
- System acceptance
- Documentation
- Client staff training
- Systems operations
- Maintenance of equipment and software
- Financing

The vendor's financial responsibility includes financial risk for the success of the system. As part of the contract, the SI vendor gives a warranty for the success of the system. This, essentially, guarantees that the system will be delivered as stated, will operate as promised, and will cost the agreed upon amount.

Appendix A of this report contains additional definitions used by INPUT to describe the information systems industry.

6. Market Parameters

The following characteristics are typical of complex, multidisciplinary information systems integration projects. They form the basis of the forecasts included in this report:

- Projects are usually multiyear.
- Projects have significant project management demands.
- Target systems are usually strategically significant to the client's organization.
- These systems require significant portions of the software to be custom developed and may include a large network requirement.

7. Industry Market Sectors

For purposes of analysis, INPUT identifies a total of 15 vertical markets, including the federal government. INPUT's market segmentation is shown in Exhibit I-5.

INPUT's industry sector definitions are derived from the U.S. Department of Commerce SIC (Standard Industrial Classification) codes. Appendix A lists the SIC codes at the two-digit level and shows how they map into INPUT's industry-specific sectors.

EXHIBIT I-5

Industry Market Sectors

- | | |
|----------------------------|-------------------------------|
| • Discrete manufacturing | • Process manufacturing |
| • Transportation | • Utilities |
| • Telecommunications | • Retail distribution |
| • Wholesale distribution | • Banking and finance |
| • Insurance | • Health services |
| • Education | • Business services |
| • Federal government | • State and local governments |
| • Miscellaneous industries | |

B**Methodology**

Data for this report was derived from a number of sources. INPUT assembled the data into matrices of industries, project types, vendors, etc. The sources and data are as follows:

- Data came from interviews with organizations that have recently completed or are now implementing complex systems. Every year over 100 new SI programs are added to the data base.
- Information from the U.S. Department of Commerce and comparisons with the systems integration program data base formed the basis of the update of the 1991 CSI market forecast. Additional federal information was derived from government budget submissions, contract awards, and INPUT's PAR data base.
- INPUT's baseline data was derived using the following process:
 - Estimates of the number of establishments (by industry) capable of supporting a major project effort came from INPUT's knowledge of current activity in CSI and the Department of Commerce list of firms in each of the SIC codes.
 - INPUT estimated the proportion of these companies that might actually have major SI programs in any year and tested the estimates by interviews. The sample was the basis of the number of possible programs.
 - The basis of the estimate of the average dollar value of these major programs was current CSI contracts. The average value was grown at a nominal rate, including inflation factors.
- Assumptions used to estimate the proportion of the total dollar value to be contracted to vendors each year are shown in Exhibit I-6. The sum of the contract expenditure in a given year provided amounts for CSI spending in that year.
 - To spread the contract over the life of the program, INPUT initially assumed an average program life of three years for development. For simplicity, the out-year spending for support, operation, and maintenance was accumulated in the fourth year. Research for this report results in the conclusion that the duration of many programs has been reduced significantly. Companies now report program durations closer to one-and-a-half or two years than to three years. Data from previous forecasts has been adjusted accordingly. Not surprisingly, larger dollar value programs generally had a longer duration.

- INPUT estimated, by industry, the proportion of the total program dollars spent on each component and calculated the percent of the total spent in each year of the program.

EXHIBIT I-6

Typical SI Contract Yearly Expenditures

Expenditure	Percent of Total Contract		
	Year 1	Year 2	Year 3
Computer Equipment	60	40	-
Communications Equipment	35	65	-
Systems Software Packages	75	25	-
Applications Software Packages	60	40	-
Consulting	75	25	-
Program Management Fees	50	40	10
Design/Integration -	60	40	
Software Development	-	55	45
Education/Training and Documentation	-	33	67
Maintenance and Systems Operations	-	25	75
Other	-	20	80

- Estimates of the range of values and growth rates of the industry-specific and cross-industry sectors and program components were derived from the following:
 - New estimates of sector growth rates came from analysis of the range of contract values in the SI program data base for each vertical industry. This was done using the updated 1991 model and the preliminary forecasts of 1992.
 - Component (hardware, professional services, software, and other) estimates were compared to summaries of programs in the SI data base. The model used for forecasting in 1991 was adjusted accordingly. These adjustments were related to vendor-supplied revenue estimates and to vertical industry market data.

- Market shares came from interviews of vendors conducted by INPUT in 1992 for the Annual Information Industry Survey and the new SI Competitive Analysis profiles. Substantial analysis was necessary to adjust vendor revenues to provide consistent, comparable data.
- Details of program composition also came from the SI program data base, along with estimates of technology utilization, infrastructure integration, and application trends.

C

Economic Environment

Despite concern about the painfully slow growth in the U.S. economy in 1992, information services industry vendors reported that the environment offers significant opportunities and challenges.

- The annual increase of business in the industry of over \$10 billion still makes it one of the more attractive areas of opportunity in the economy.
- Demands to address the low level of economic growth have led to vendor projects
 - Increasing revenues through improved geographical analysis of sales coverage
 - Improving service and product quality through client/server systems that enable users to communicate among functions more effectively

The U.S. information services industry is growing at a slower rate in the 1990s than it did in the prior decade. Although the industry is rebounding slightly from the recession, it is not likely to return to the growth rates of the early 1980s. Vendors cannot rely upon a favorable growth climate to help many of their product and service initiatives.

The industry did reach a milestone during 1990, advancing beyond a level of \$100 billion in size.

- The industry increased in size over five times during the 1980s and is 50 times larger than it was in 1970, when the industry represented \$2 billion in user expenditures.
- By 1997, the U.S. information services industry will reach a size of \$200 billion, when the annual increase in absolute terms will be in the \$20 to \$25 billion range.

High rates of growth for the sale of software products and professional services provided the engine for growth during most of the last decade. As rates for increases in sales of these delivery modes fell back, there were concerns about continuing vigor in the information services industry.

- Growth of U.S. information services expenditures has been reinvigorated, however, by interest in outsourcing, restructuring, and downsizing business applications systems and by increasing use of network services in addition to continuing vigorous growth in systems integration.
- In effect, the information services industry has been shifting from sales of products and services for new applications systems to sales that will upgrade, manage, and outsource the use of information technology by users. This shift will continue to increase because it is driven by the need to restructure business to achieve greater effectiveness, productivity, and revenues.

On a worldwide basis, the industry continues to experience higher growth rates, close to 20%, and many U.S. vendors are experiencing growth overseas that exceeds that of the U.S. industry as a whole. Some international vendors are successfully penetrating the U.S. market.

- This growth is primarily due to the relative stage of automation in many foreign markets, but the focus on specific industry markets in some countries is also a strong factor.
- Inflation rates and somewhat stronger economies have also helped to drive the global use of information services in the last few years, but these factors may have less of an impact this year.

1991 results in the U.S. are analyzed below on a delivery mode basis:

- Although systems integration, systems operations, and network services are not among the top three delivery modes in size, their rapid rates of growth (16% to 19% CAGR) are responsible for maintaining and increasing the rate of growth in the industry as a whole.
- The software products sectors are maintaining a rate of growth near or slightly above the industry average (about 12% CAGR).
- The industry averages are pulled down by the slower rates of growth in the large professional services and processing services sectors, as well as by the smaller turnkey systems sector (7% to 9% CAGR).

Growth in professional services, which was mired at a rate of 6% in 1990 when projects were delayed or dropped, rose to 9% in 1991 and 1992, which was still lower than the growth during any year in the past decade. In some vertical markets, growth of professional services in 1990 through 1992 was more than 50% less than growth during 1988.

Although the economic recession was the principal factor causing the drop in the rate of growth for systems integration and other information services during the past two years, it did not have an equal impact on the use of systems integration in various markets or on the vendors offering these services.

- Some major vendors as well as smaller ones had growth rates for services that were over 10% above the average results, whereas other vendors had less favorable impacts on revenue and earnings.
- A number of vendors of information services, such as IBM, Electronic Data Systems (EDS), and Digital Equipment Corporation, as well as Ask and American Software, have offered professional services as a step toward the use of other products or services, such as SI or outsourcing, or as a support for other services and products, such as software products or network services. Many of these vendors tend to have growth rates for the use of professional services that are above industry averages.

Many systems integration vendors have been evaluating changes in objectives, target markets, types of assignments, and use of technological and other skills resulting from the impact of the economy on business markets during the past two years.

The market analysis and forecast for 1992-1997 systems integration is more sensitive to the economic conditions than has historically been the case. Clients' budgets for information systems are growing more slowly and a small percentage show an actual decrease. Companies that are able to invest in information technology during slow economic times will be best positioned to grow their business when the recovery accelerates. There is a direct relationship between the degree of a company's automation and its ability to grow rapidly. The aggressively automated companies will gain market share during the initial recovery phases.

Forecasts are presented in current dollars (i.e., 1997 market sizes are in 1997 dollars). INPUT has used the following economic assumptions for the U.S. economy as a whole. The GDP and GDP Deflator growth rates used in INPUT's market projections for 1992 are from the CONSENSUSTM forecast, Blue Chip Economic Indicators of Sedona, Arizona. The Blue Chip CONSENSUS forecast is derived from a leading panel of economists representing leading financial, industrial, and research firms across the U.S. and has a 13-year track record of balanced and accurate projections.

Exhibit I-7 provides both the economic assumptions used by INPUT in the 1991-1996 market analysis reports and those being used for the 1992-1997 report.

In summary, the economic assumptions used by INPUT reflect significantly reduced (even negative) growth in the near term followed by modest, steady growth through 1997. Note, however, that much depends on how quickly the economy rebounds from the recession.

EXHIBIT I-7

GDP and Inflation Growth Rate Assumptions, 1991-1997

Overall	1991A	1992E	1993E	1994E	1995E	1996E	1997E	Avg. 91-96%	Avg. 92-97%
Nominal GDP	3.4	5.3	6.2	6.7	6.1	6.1	5.9	6.1	6.2
GDP Deflator	3.0	2.9	3.2	3.6	3.7	3.6	3.6	3.4	3.5
Real GDP	0.4	2.4	3.0	3.0	2.3	2.4	2.2	2.6	2.6

Source: Blue Chip Economic Indicators

D

Report Organization

Following the Introduction, the report is organized as follows:

- Chapter II, Executive Overview, highlights the most significant information in the report.
- Chapter III, Market Analysis and Forecast, defines the structure of the market, analyzes the marketplace and competitive factors, and forecasts five-year growth by component and industry, including 1991 market share information.
- Chapter IV, Vertical Industry Markets for Systems Integration, provides an analysis by vertical industry market. It provides an analysis of the forces on, and potential of, the 15 industry-specific markets. It provides a forecast for each industry sector.
- Chapter V provides a summary of market strategies and recommendations. It focuses on the key elements vendors should consider to win systems integration programs.

The body of the report is followed by several appendixes that include the following:

- INPUT's *Definition of Terms* (Appendix A)
- SIC/industry codes (Appendix A)
- Forecast data bases (Appendix B)
- Data base reconciliation (Appendix C)

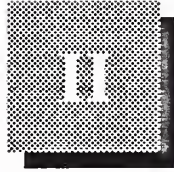
E

Related Reports

Related INPUT reports of possible interest to the reader include the following:

- *U.S. Processing Services Market Analysis Report, 1991-1996*
- *U.S. Application Solutions Market, 1991-1996*
- *U.S. Systems Software Products, 1991-1996*
- *U.S. Professional Services Market, 1991-1996*
- *U.S. Systems Operations/Outsourcing Market Analysis, 1991-1996*
- U.S. information services industry sector reports, 1992-1997 (15 reports on all major industry sections; e.g., insurance)
- *Market Analysis Program Cross-Industry Sector Reports, 1991-1996* (7 reports on information services markets that serve all vertical industry sectors, e.g., accounting)
- *Methods for Successful Systems Integration*
- *Network Integration—A Growing Market*
- *U.S. Systems Integration Market Forecast, 1991-1996*
- *Systems Operations Management Issues and Practices*
- *Electronic Image Processing, 1991-1996*
- *Federal Systems Integration Market, 1992-1997*
- *Systems Integration Market—Western Europe, 1991-1996*
- *Systems Integration Competitive Analysis*
- *Systems Integration Technology Trends*

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Executive Overview

A

Major Buyer Issues

The current sluggish business and economic environment is the primary issue facing potential buyers of system integration services. In this condition of uncertainty, some buyers are delaying the start of large SI programs, while others are looking to a modular approach with a faster payback. The slow economy has increased the competitive pressure for most companies. These pressures are forcing companies to focus on their core businesses. Nonstrategic functions like systems integration and systems operations are being outsourced. Many companies are turning to technology to gain a competitive advantage by reducing costs, providing superior service, expediting product development, and improving quality and productivity. These new solutions are becoming increasingly complex as they change traditional business processes and serve new organizational structures requiring around-the-clock and around-the-world operations. Exhibit II-1 synthesizes the major 1992 buyer issues.

EXHIBIT II-1

Major Buyer Issues—1992

- The economy
- Core business focus
- Competitive demands
- Increasingly complex solutions
- New technology applications
- Unavailable skills

As INPUT studies information systems budgets, it has become apparent that an increasing amount of information systems expenditures are no longer controlled by internal information systems organizations. This is because user organizations are, in many cases, becoming the buyers of solutions, and they control the budgets for them. The decision to use an outside vendor to provide system integration services has become more of a business issue and less of an information technology issue.

Many of the solutions that users seek include new technologies such as artificial intelligence, image processing, and a variety of advanced telecommunications alternatives such as LANs, WANs, and MANs. Systems integrators with good track records provide an attractive alternative to internal information systems organizations that often lack adequate resources and skills to meet new user requirements. Some internal organizations also lack applications knowledge and experience in new technologies to develop solutions in-house.

B

Market Forecast, 1992-1997

During 1990, the domestic economy slowed and domestic industries spent \$533 billion for plant and equipment, an increase of 5.0% over 1989. This was less than one half of the 1988-to-1989 increase of 11%. In 1991, investment in plant and equipment was \$528 billion, a decrease of 1%. The forecast for 1992 is \$551 billion. Although industry will continue to invest in new capital equipment, INPUT believes that the recession will slow down the number of new commercial SI (CSI) programs that are started in 1992. The slow economy, increased transfer payments, lower tax revenue, and budget deficits are also having a negative impact on the growth of federal SI (FSI) programs.

Actions by the industry to solve the business problems it faced increased expenditures for commercial systems integration to \$4.6 billion in 1991, despite predictions of a lower 1991 GDP. INPUT forecasts that a still cautious industry will selectively invest in new and expanded information systems in the near term, and that total expenditures for vendor-provided CSI solutions will reach \$13.1 billion in 1997. This sum represents a CAGR of 19%, the same as predicted last year. Narrowing margins and reluctance to invest in new information systems solutions, and much less use of outside vendors to implement them, are expected to continue to hinder demand for systems integration. Exhibit II-2 provides the forecast for both the commercial and federal markets.

When considering the overall commercial systems integration market, several points are of particular note:

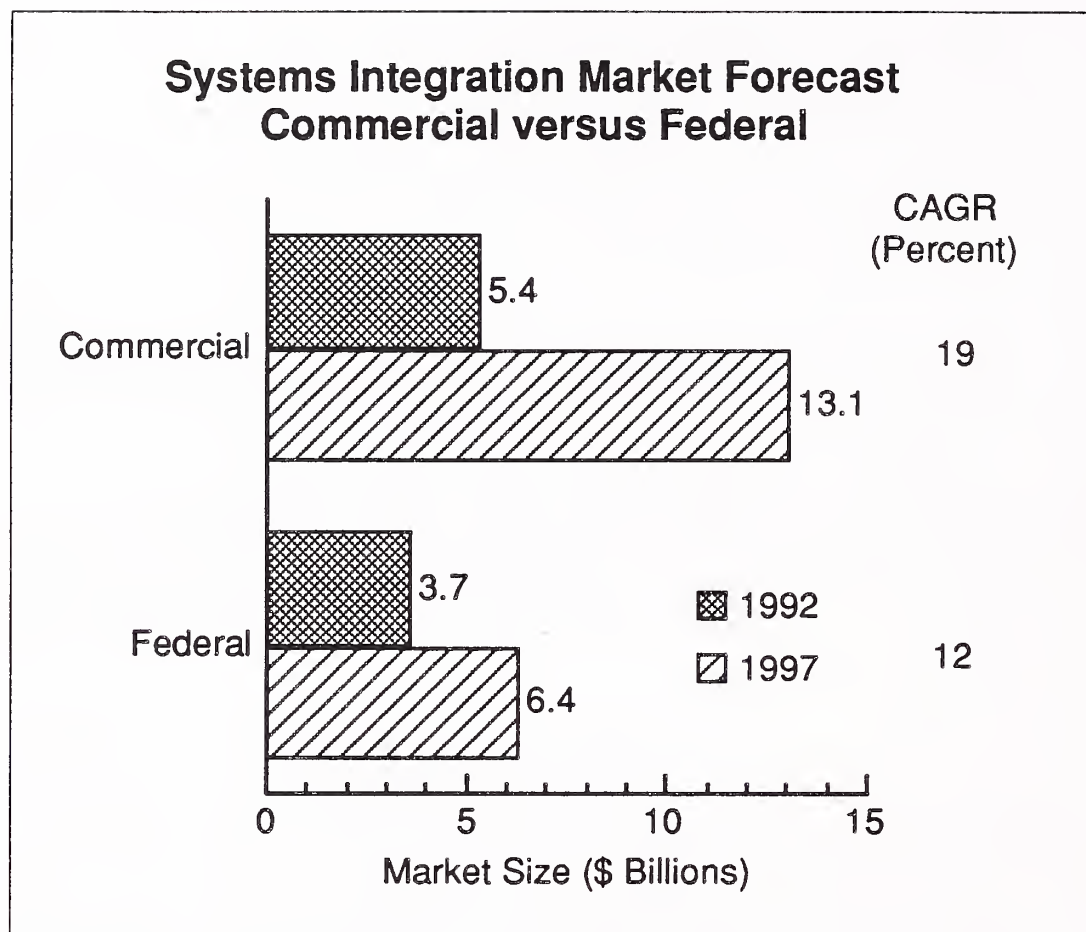
- The recession, overall economic lethargy, and financial difficulties in specific industries (manufacturing and banking/finance in particular), have contributed to slow growth of the systems integration market over the past year.
- The length of programs has become shorter. Organizations indicate a need for short-term payback from new systems. This has contributed to the definition of programs that are smaller, requiring less time to implement, and resulting in shorter term paybacks.
- With smaller program sizes, program values have also declined. Organizations indicate that they are spending half as much on new programs as they were two to three years ago. The reduced spending reflects both keen competition for capital and the need for shorter term investment benefits.
- Vendors themselves are also helping clients reduce the expenditures for SI. That hardware prices will continue to decline is axiomatic. Less apparent are the dramatic improvements being made in vendor productivity because of CASE (computer-aided software engineering) tools, program management tools, reusable software, legacy system re-engineering, network and application software, and the general SI learning curve. Competition among vendors is also helping to control client expenditures. These cost avoidances are being somewhat offset by increasingly complex systems requiring the latest technological improvements and substantially higher networking content.

The net result of shifts in project size, project value, and the impact of technological and economic pressures has been to bring the forecast for the systems integration market more in line with the slower overall growth of the information services industry, at least in the short term.

In the longer term, INPUT expects the systems integration market to rebound and outpace the overall market, but significant changes should not be expected until economic confidence has been restored and companies are more disposed to make additional investments.

The growth in demand is focused in a few vertical industries, and is not uniformly spread across those facing increasing competition.

EXHIBIT II-2



There are several important points to note about the five-year forecast for the commercial and federal systems integration markets:

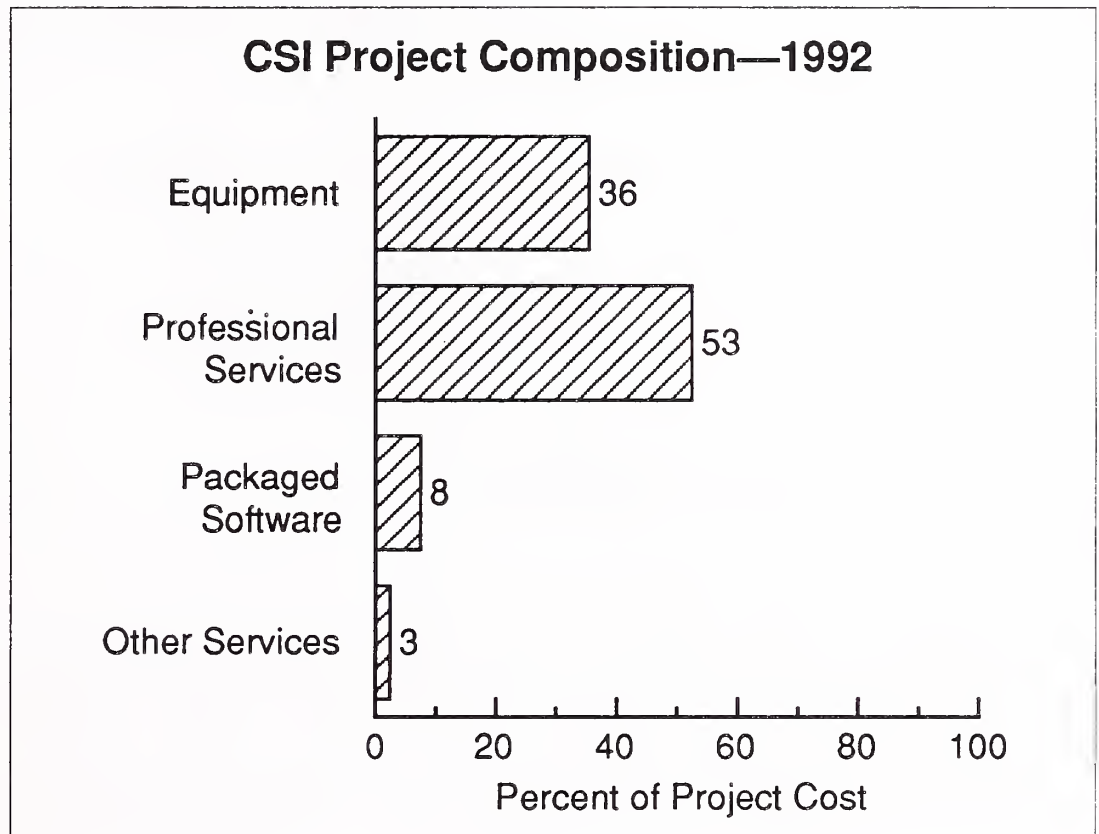
- The commercial market is expected to experience a somewhat shallow growth rate (12% to 13%) over the next one, perhaps two, years. Although interest rates have dropped, availability of capital remains limited, and there are numerous conflicting priorities.
- The commercial market is expected to rebound in the latter years of the forecast period, assuming that the economy picks up. Organizations note that there are numerous committed projects that need to be funded.
- Although the federal systems integration market is affected by the economy to some extent, the major shifts in government emphasis is having a greater impact. The demise of the USSR and critical domestic problems have combined to force a shift in spending and therefore in programmatic emphasis. In the near term, the result is a slowing of growth of FSI opportunities, but in the mid-to-long term, more new SI programs will be initiated.

C

SI Project Composition

SI expenditures can be broken into four basic components: computing and telecommunications equipment, professional services, systems and applications software, and other ancillary expenditures. The distribution of these expenditures in 1992 and 1997 is shown in Exhibit II-3.

EXHIBIT II-3



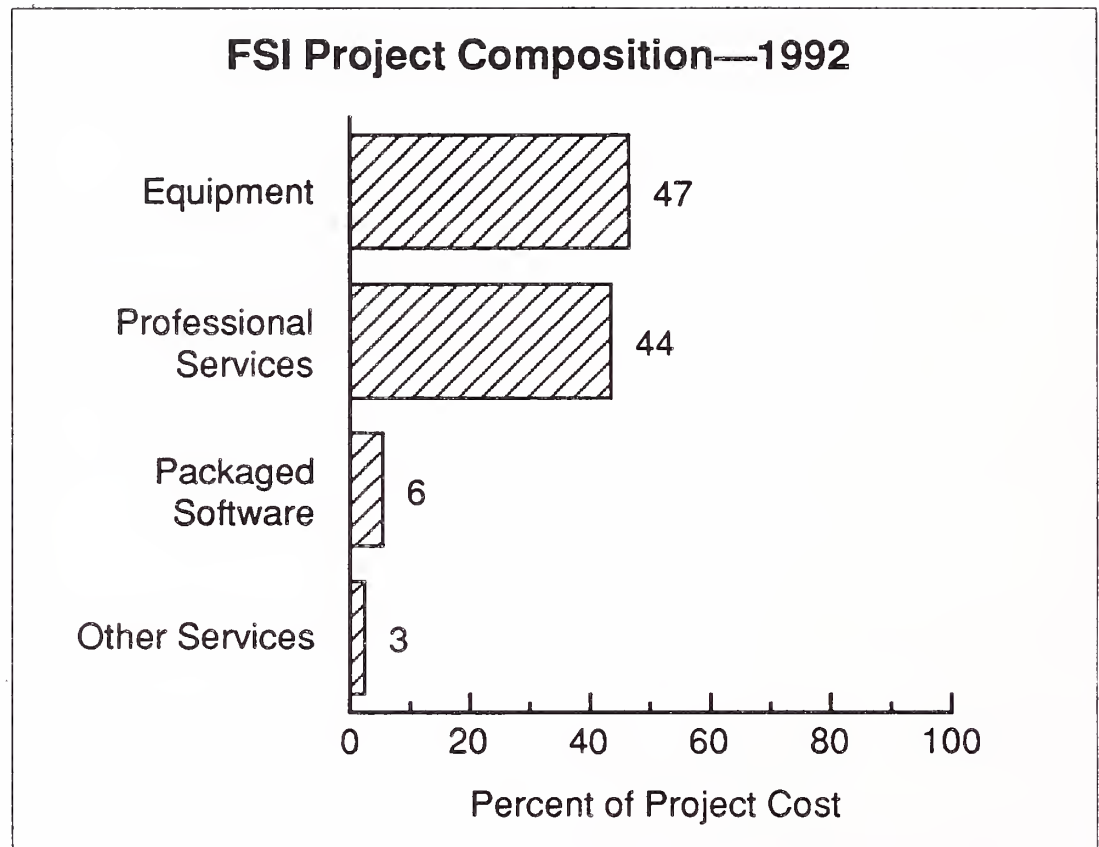
Earlier forecasts projected that expenditures for equipment would decline as a percent of the total, and they have, but the decline appears to have bottomed out and has actually increased. Analysis of hardware expenditures indicates that price declines are more offset by increases in the acquisition of client/server equipment and networks that integrate the process of delivering information throughout the organization.

Organizations in nearly all industries note a need to better understand the relationship between integrated systems and integrated business operations. This need results in greater expenditures for consulting and design/integration.

All of the major SI vendors have recognized the need to include business process re-engineering or business process change analysis as part of their SI engagement offering. This service has become so important that it is now often separated from the SI program and treated as a consulting engagement.

As shown in Exhibit II-4, FSI has a project composition more heavily weighted toward equipment. This is a result of federal programs usually involving large amounts of data, higher geographical dispersion, and the most advanced technologies. Since government procurements involve very detailed specifications, vendors are able to concisely structure the professional services component of their bids. Professional service labor rates are very competitive in the government market.

EXHIBIT II-4



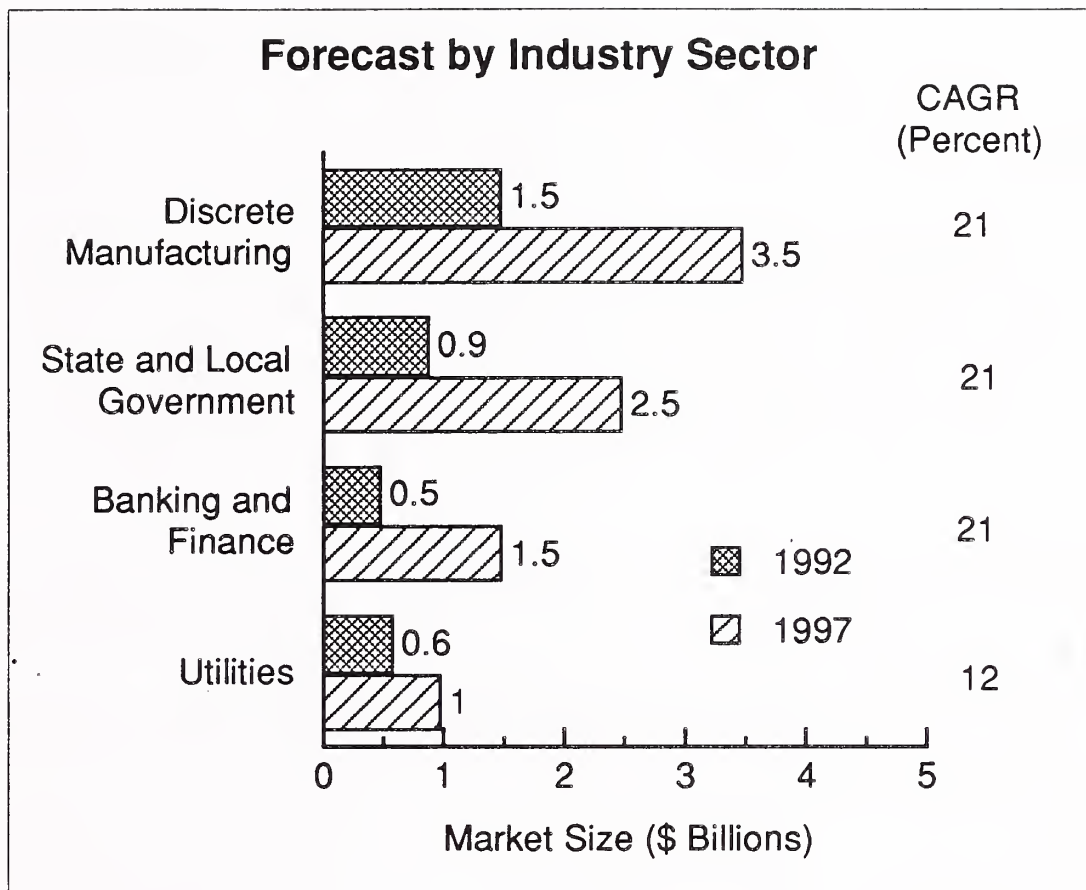
D

Forecast by Industry Sector

Discrete manufacturing was the largest market for systems integration in 1991, and it will continue to be throughout the forecast period. Key business functions continue to be streamlining and integrating the entire product design development, logistics, manufacturing, and distribution processes. This is a massive undertaking for most companies, but it is essential to retain competitiveness and market share.

As shown in Exhibit II-5, state and local government will be the second largest CSI market over the forecast period. These organizations have many of the same problems as the federal government, and provide integrators with an opportunity to replicate a solution over a sizable number of governments.

EXHIBIT II-5



The third largest CSI market is utilities. This industry has a special set of applications, generation plants, and network management systems that provide opportunities for a number of industry-focused vendors. Although its growth rate is relatively slow (a CAGR of 12%), it will continue to provide opportunities over the five-year forecast period, but it will slip from third to fourth in size by 1997.

The fourth largest CSI market in 1991 was banking and finance, and it will be third largest in 1997. This sector will continue to recover from the impacts of deregulation, the thrift crises, and lower volumes in the brokerage community. There will still be a need for integration of a number of individual services into systems that include all of a customer's activities with the institution.

E

Vendor Goals and Objectives

Most of the vendor goals and objectives identified in Exhibit II-6 are market driven. Systems integration is a very high-level distribution channel for the complete range of information and telecommunications products and services. It provides or limits product access to the largest users in U.S. industry. Vendors who do not have access to this channel fear that they will lose market share and control of their existing custom-

ers. Many vendors have established SI divisions. The purpose of these divisions is to provide access to this distribution channel.

EXHIBIT II-6

Vendor Goals and Objectives

- Long-term account relationship
- Decentralized services
- Full-service image and offerings
- Industry knowledge and skills
- Market coverage
- Proprietary products and methodologies
- Market participation

The information industry has evolved from a product to a services orientation and from an environment where the customer was totally responsible for implementation to one where vendors are assuming responsibility. Customers are seeking one-stop shopping and vendors are striving to add additional products and services to become full-service providers. User organizations are clearly looking outside for a single point of responsibility.

Product and service providers are adding front-end consulting and back-end operations management. Some are seeking to achieve these goals by building from within or by making acquisitions. Others look to alliances to provide this full-service image.

For the most part these services need to be located physically close to the customer. Many vendors have abandoned centralized SI organizations, and moved SI resources into their field organizations. SI engagements are becoming oriented to the clients' site structure rather than the vendor's organization.

Vendors recognize the importance of understanding the client's business, particularly in an environment where long-term relationships are important. To achieve this goal, vendors are making significant investments in industry architectures and solutions, hiring industry experts, and establishing alliances with consulting firms or professional services firms that already have industry expertise.

The larger vendors that already have product industry coverage have improved their SI vertical industry coverage to protect their existing customer relationships. Smaller vendors are honing niche skills and gaining market coverage through alliances with larger vendors.

Vendors are building and marketing proprietary products and methodologies. Solid methodologies for business analysis, requirements analysis, systems design, program management, change management, and integration and implementation improve the odds for program success and reduce the risk of catastrophic failure. These methodologies also build a record of success that can be used for reference selling. Framework products continue to be developed that can be tailored to satisfy a client's specific business needs.

Finally, a growing number of secondary vendors are seeking participation in the market. Many have products that were previously sold as standalone systems but are now candidates for integration into larger solutions. These products include basic computing equipment as well as robots, warehouse storage and retrieval systems, on-board computers, and a variety of communications products. Other vendors seeking SI participation include companies that have developed solutions internally and want to market these skills to others in their industry.

F

Vendor Market Share, 1991

Exhibit II-7 shows market shares of the top five vendors in 1991.

IBM was the leader in both the commercial and government industry sectors of systems integration in 1991. IBM has increased its focus on the SI market with the formation of its Applications Systems line of business. This organization goes beyond systems integration and is focused on providing a full range of solutions, from packaged applications software through large, tailored integrated solutions. During 1990, IBM moved its tactical commercial SI resources from its former Systems Integration Division directly into the field marketing organization, closer to the customer.

During 1991, IBM's field organizations have restructured to better address the requirements of the SI marketplace. Also in 1991, IBM formed Integrated Systems Solutions Corp. (ISSC). Though primarily focused on outsourcing of systems management opportunities, it will also address some SI programs. IBM's Federal Sector Division will deliver FSI services.

Andersen Consulting, little known in the information services industry just a few years ago, continues to demonstrate dramatic growth in the SI market. Ranked third in 1989, Andersen moved to second place in 1991, based almost entirely on commercial SI revenues where it is now the revenue leader.

For the 1991 market share ranking, INPUT imputed additional equipment expenditures to Andersen Consulting. This represents equipment expenditures as part of an SI program but not directly purchased from Andersen. Because of Andersen's business and accounting practices this is necessary to equitably compare user expenditures and market share. Andersen has followed a long-term strategy that focuses on its clients' entire business processes. It starts with business consulting to assist in client management of change in organizational and business processes, flows into implementation, and in some cases continues with a long-term systems operations contract. Andersen is vertical industry-oriented and has skills, technology and/or demonstration centers, and software products to address most industries.

EXHIBIT II-7

Vendor Market Share, 1991

Vendor	Revenue (\$ Millions)	Percent
IBM	1,750	17
Andersen Consulting	787 ⁽¹⁾⁽³⁾	8
EDS	770 ⁽²⁾	8
Digital	565	6
Computer Sciences Corp.	478	5

1. Includes INPUT's estimate of equipment content

2. Non-GM business only

3. Adjusted to calendar year 1991

EDS is a leading processing services/SI vendor, second in SI revenues to IBM in the federal sector, and third overall. One of its strengths is its familiarity with vertical markets based on its experience in remote data processing and/or systems operations (facilities management) in most industry sectors.

EDS also benefits from the manufacturing industry and telecommunications experience of its parent (GM). Systems integration is an excellent vehicle for EDS to protect existing systems operations customers and

develop new ones. Strong program management and risk management practices have made EDS an aggressive competitor.

Computer Sciences Corporation (CSC) made its SI mark in the government sector (both state and federal), employing its extensive experience as a full-service vendor to win contracts. This firm is third in the federal sector and a frequent competitor of EDS. CSC also has broad commercial SI experience and is increasing this business through an aggressive acquisition program.

Digital's ranking has jumped significantly over the past few years, resulting in Digital replacing Unisys in the top five vendor ranking. Over the past year, Digital has made significant strides in unifying its systems integration line of business. An estimated 90% of Digital's revenues are from the commercial market. A significant portion of that is from the manufacturing sector, where Digital has established a strong foothold based on its equipment business.

Not all of the leading SI vendors have increased their SI business quickly enough to keep pace with the growing market. Therefore, they have lost a small amount of market share. There are several factors that have contributed to this result. One is that it is very difficult for a company to manage a business in excess of one-half a billion dollars and have it grow in excess of 16% CAGR. The market leaders are addressing this by creating suborganizations with separate market segment responsibilities. A more difficult issue for the market leaders is the success being enjoyed by newer entrants and industry- or application-focused niche companies. INPUT now counts 39 companies with SI business in excess of \$50 million in 1991.

INPUT believes that it is unlikely that any two of the larger vendors will formally merge. The largest vendors will selectively make investments in niche companies, form various types of alliances and strategic partnerships, and acquire products and companies. The equipment vendors in the SI market are likely to separate into spin-off companies defined by their SI activities. This is necessary to break the stigma of a tie to the parent company's equipment solution. Bull/Integris, Control Data Corporation (CDC)/Ceridian, and IBM/ISSC are examples of this direction.

G

Recommendations

Systems integration is one of the services that clients seek as they continue to use a broad range of information services delivery mode alternatives. Clients want services that range from front-end consulting, through SI, to systems operations. INPUT believes that commercial businesses and public sector organizations will continue to choose vendors that can offer

the full range of these services, even if the specific program does not involve all of those vendor capabilities. Equally important is the notion that once a vendor is selected to do the front-end consulting, it is in a favored position to win the systems integration and even systems operations contracts. Vendors should strive to present this full-service image, as indicated in Exhibit II-8.

EXHIBIT II-8

Recommendations

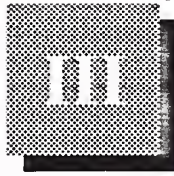
- Present full-service image
- Leverage unique capabilities and products
- Establish strategic partnerships (alliances)
- Manage risk
- Develop industry-focused market strategies

Vendors should assess their current skills and capabilities and build strategies that use them effectively. SI includes too much risk to attempt to provide broad industry coverage if the vendor does not have the necessary skills or experience.

SI is a very complex business. Few vendors have all of the products, skills, and capabilities to satisfy the complete requirements of systems integration programs. Teaming, program partners, and alliances are common approaches used to meet a client's integration requirements. Vendors must establish a set of relationships and alliances for long-term success in this market. Partners should be selected carefully and the resulting alliances managed thoughtfully.

Systems integration is a high-risk business, with great potential for success and failure. Some clients are aware of the gamble and will give higher rewards to the vendor that can demonstrate a good track record of risk management and containment. One reason that clients use SI vendors for complex programs is to have the vendor assume the risk of producing a complete, successful system. The vendor must introduce risk management into every phase of the program.

Success and customer acceptance is based on confidence in the vendor's track record in providing solutions in the customer's industry. Therefore, to be successful, vendors must develop focused strategies for each selected vertical market to be addressed.



Market Analysis and Forecast

The market for systems integration provided by outside vendors in the commercial and federal sectors continues to grow and mature. Economic and competitive conditions are placing increased pressure on business to establish lean and financially sound organizations. Productivity and quality improvement through implementation of new technologies are one element of the answer.

These pressures, coupled with a lack of skilled employees to develop and manage large complex projects, cause businesses to continue to look to outside sources to develop and integrate their information support requirements. However, as is discussed later, there has been a recent shift in focus to programs that will result in shorter term returns and more modular implementation.

Similar conditions triggered the use of outside vendors for systems integration in the federal government market more than thirty years ago. Although there are differences between the two sectors—principally in how opportunities arise and are bid—the product and service components appear to be quite similar. Many vendors in the market now have contracts in both sectors.

In this chapter, INPUT defines the market, and sizes and forecasts the components. Key driving and inhibiting factors are identified, and the competitive environment is described. The first step is to establish the systems integration (SI) market structure.

A

Market Structure

Understanding INPUT's definition of SI is important to understanding the contents of this report.

1. General Market Characteristics**a. Definition**

Systems integration is a vendor-provided service that results in a complete solution to a complex information system, networking, or automation requirement through the custom selection and implementation of a variety of information products and services.

A systems integrator is responsible for overall management of a systems integration contract. The integrator is the single point of contact and is responsible to the buyer for system function, performance, schedule, cost, and final delivery.

Critical to the approach, from both the client's and vendor's perspectives, is the sharing or total transfer of responsibility (and risk) for the successful development of the system from the client organization to the vendor(s). In exchange for assuming the risks of failure to deliver the desired solution on time and within budget, the integrator receives program management fees from the client. The integrator also receives markups on the work of subcontractors and has the inside track for providing any of the products and services that make up the total solution and follow-on services, such as application and equipment maintenance and systems operations.

b. Products and Services

INPUT divides systems integration into four components:

- Professional services
- Equipment
- Packaged software
- Other services

This approach allows a more comprehensive comparison of programs in and between different commercial sectors, as well as with the federal government sector. At times, the professional services component is subdivided into software development, program/project management, consulting, design/integration, education/training and documentation, and systems operations (facilities management).

Exhibit III-1 lists the products and services that may be part of a systems integration program and from which the vendor can expect to receive revenue. Since each program has unique requirements, not all of these components apply. Further, specific client requirements dictate the proportion of the total program expenditures for each component.

INPUT's definition results in the inclusion of all post-implementation activities included in the original contract. Post-implementation activities might include equipment/network software maintenance or systems operations (SO). SO can include equipment/network maintenance, software maintenance, extended education and training of client employees, and network management. Note, however, that SO provided as part of a systems integration contract is distinct from SO provided as a separate contract.

Several products and services are excluded from INPUT's definitions of SI and the list shown in Exhibit III-1. They are:

- Embedded systems that are end-connected to machinery or tools or industry-specific transportation facilities
- Robots and dedicated automation equipment separately programmed and operated outside of the plant information system(s) data stream
- Turnkey systems prepackaged to satisfy a specific application or applications and not substantially customized to meet a specific client's requirements.

EXHIBIT III-1

**Products/Services in
Systems Integration Programs**Equipment

- Information systems
- Communications

Software products

- Systems software
- Applications software

Professional services

- Consulting
 - Feasibility and trade-off studies
 - Selection of equipment, networks, and software
- Program/project management
- Design/integration
 - Systems design
 - Installation of equipment, network, and software
 - Demonstration and testing
- Software development
 - Modification of software packages
 - Modification of existing software
 - Custom development of software
- Education/training and documentation
- Systems operations/maintenance

Other miscellaneous products/services

- Site preparation
- Data processing supplies
- Processing/network services
- Data/voice communication services

2. Commercial versus Federal Systems Integration

The federal government has relied on systems integrators to develop, upgrade, or replace automatic data processing systems for over thirty years. Commercial systems integration, with some of its roots in federal SI, has both striking similarities to and differences from government contracting (see Exhibit III-2).

The commercial sector customer often has not completed a thorough requirements study. Therefore, the customer looks to the vendor for these activities as part of the proposal process or as a separate consulting contract. In the federal market, the customer typically has spent a considerable amount of time developing a detailed set of requirements and/or specifications that are included in the Request for Proposal (RFP). Generally, in the federal sector, if a vendor develops the specification, that vendor can be precluded from bidding on the entire contract.

The commercial sector customer is less likely to have the legal or technical background required for SI programs. When this knowledge is available, it may be fragmented among many people on the client staff. In the federal government, on the other hand, program offices are established that include both technical and legal representatives that speak for the sponsoring agency. Fewer interfaces are involved.

A key difference between the two markets is the formality of evaluating vendors in the bid selection procedure. In the federal marketplace, estimated versus actual vendor performance on cost and schedule is recorded (the Defense Contract Audit Agency does this for the Department of Defense (DoD), but it makes the evaluations available to all agencies). Agencies use this historic information (called Weighted Guidelines) to assess the vendor's past performance. Several laws control what information can be disclosed to vendors during various procurement stages.

In the private sector, a track record of successful federal implementations may be desirable and leverageable, but caution needs to be exercised. Development and project management requirements are considerably different in the private sector than in the federal sector. Conceptual strength and reporting results are key requirements in the private sector because the private customer relies on the vendor to offer a business solution. State and federal agencies are more specific about the desired solution and require considerably more detail.

Business conditions associated with the two markets are widely divergent, with some definite advantages to the government market. Federal agencies advertise in the *Commerce Business Daily* (a Department of Commerce publication) about impending solicitations and describe key programs in publicly available documentation. INPUT has a separate program and data base that identifies federal SI opportunities. Field sales can help to qualify the opportunity. Commercially, the vendor is heavily dependent on the sales force for leads.

EXHIBIT III-2

Commercial versus Federal Systems Integration Characteristics

Characteristics	Commercial	Federal
<u>Customers</u>		
Requirements knowledge	Low	High
Technical knowledge	Variable	High
Interface	Multiple	Single
<u>Vendors</u>		
Vertical expertise	Preferred	Mandatory
Customer base	Leverageable	Reference
Business knowledge	Required	Optional
Reputation	Media-based	Historic
<u>Business Conditions</u>		
Lead generation	Field sales	<i>Commerce Business Daily</i> /budgets
Competitive bids	Optional	Required
Bid complexity	Variable	High
Expenditure commitment	Deferrable	Uncertain
Risk exposure	High	Contained
Contract type	Fixed-price	Mostly fixed
Price restrictions	Competitive	Ceilings
Bonuses	Occasionally	Award/incentive
Penalties	Occasionally	Exception
Profit potential	High	Limited percentage/high actual \$
Time to award	Business-driven	Procurement process

The requirement for competitive bidding for contracts over \$100,000 in the federal sector has no counterpart in the private sector. Although the client can use competition to achieve a desirable solution at the best price, other factors (vendor reputation, industry knowledge, comfort level with the vendor, etc.) do come into play. Furthermore, requirements for competitive bidding prohibit agencies from specifying name brand products in an RFP. The federal process is more open and public, fostering a level of competition in which discounting in fixed-price bids is frequent.

Competitive bidding in the federal sector is a complex process that involves considerable expenditure of time, effort, experience, and money—with no assurance of award. Vendors can recover part of their bid and proposal expenses, but the amount is stringently controlled. The trade-off is that once the procurement process starts, a contract is usually awarded. In the commercial sector, expenditure commitments may be deferred or withdrawn at the client's choosing, with no recourse for the bidding vendors.

Risks to the contractor appear to be much greater in the private sector. The contracting rules in the federal sector lead to compliance with the letter of the specifications and some measure of risk sharing with the client agency. The absence of these rules in the private sector creates an environment where the specifications are more at issue and, consequently, more subject to interpretation (and misunderstanding), thus creating the prospect of contract performance suits.

Unless a contract is fixed price, federal regulations may specify price ceilings. Fair pricing regulations specify that profit can be no more than 15% on fixed-price contracts, and they permit agencies to audit vendor records. There are no such rules in the private sector, where competition and demand determine the acceptable price range.

Vendor capabilities in the private sector are usually based on written proof, previous success testimony, or live systems demonstrations emulating a critical function of the desired system. In the federal marketplace these capabilities must be proven. Satisfactory evidence may be scores under the Weighted Guidelines, actual performance against project benchmarks, or direct comparisons with competing solutions.

Pricing strategies differ in that private sector jobs are frequently fixed price without bonuses but with penalties. Government SI contracts may be fixed price, cost plus fixed fee, or a combination. Further, it is not unusual for the government to motivate a contractor with incentive or award fees to improve system performance or shorten the delivery schedule.

Federal agencies require in-depth reviews of component performance as a means of verifying/validating a contractor's work. This practice is seldom found in the private sector.

The commercial/federal SI market distinctions revolve around the procedural and regulatory (legal) backbone of the contracting process. Some of these more formal practices of the federal and state government market appear in the private sector, when clients find them beneficial. Private sector clients will eventually adopt practices that protect them.

The lengthy and expensive federal SI procurement process can cause substantial time lags from the first definition of the system requirements until contract award and subsequent system delivery. Because this process can span several years, the technology of the possible system and the costs can change dramatically. This poses the need for the potential SI vendor to evolve the potential solution even before contract award.

3. Industry Market Sectors

The design and application of information systems solutions are evolving along several avenues, each attracting vendors with particular skills, resources, and experience.

Currently, most vendors have focused on one or two vertical industries, where a successful implementation is leveraged for contractual add-ons and other awards in the same industry. Client companies rate the importance of industry knowledge and experience very high in their selection criteria. Other vendors are specialists in cross-industry (non-industry-specific) technologies, and focus not only on bidding these opportunities, but also on teaming with industry-specific vendors to improve award prospects. INPUT's 1992 SI forecast includes 14 vertical industry markets.

Industry sectors used in the SI forecast are the same as those in INPUT's Market Analysis Program (MAP) and are identified in Exhibit III-3. The SI data correlates with the MAP forecasts. Appendix A of this report lists the SIC codes associated with each sector.

EXHIBIT III-3

Industry Market Sectors

- Discrete manufacturing
- Process manufacturing
- Transportation
- Utilities
- Telecommunications
- Wholesale distribution
- Retail distribution
- Banking and finance
- Insurance
- Health services
- Business services
- State and local government
- Federal government
- Education

4. Vendor Classification

Vendors from a wide variety of core businesses have entered the systems integration business. SI has been recognized not only as a source of revenues and profits but also as an important channel for the distribution of vendors' products and services.

Computer and telecommunications equipment vendors, as well as professional services vendors, recognize that SI is a significant channel for their products. If they do not have access to this channel, they risk losing market share. In the course of Systems Integration Program (SIP) research, INPUT has developed several approaches to assessing vendors and their capabilities.

- Market share by annual revenues permits sizing of the leaders. The vendor analysis is divided into commercial and federal markets because there are substantial differences among all but a few leaders.

- Vendors can also be characterized by their market focus. Some vendors have a narrow focus and specialize in one or two vertical industry markets, whereas others attempt to provide broad industry coverage of multiple markets.
- Market share by class of competition employs six distinct classes of SI vendors' primary lines of business, subdivided into commercial and federal markets. Each of these classes has unique advantages and disadvantages in approaching the SI market. The classes used in this analysis are:
 - Hardware manufacturers
 - Communications vendors
 - Professional services firms
 - Big Six firms (and management consultants)
 - Aerospace firms
 - Other (engineering, construction, etc.) firms
- Another classification approach identifies significant secondary market vendors and their specialties. The initial examination used information acquired for INPUT's *U.S. Information Services Industry* report.

A much more detailed discussion of vendor capabilities, market shares, and strategies is contained in Section D of this chapter, as well as in INPUT's report, *Systems Integration Competitive Analysis*.

B

Market Forecast

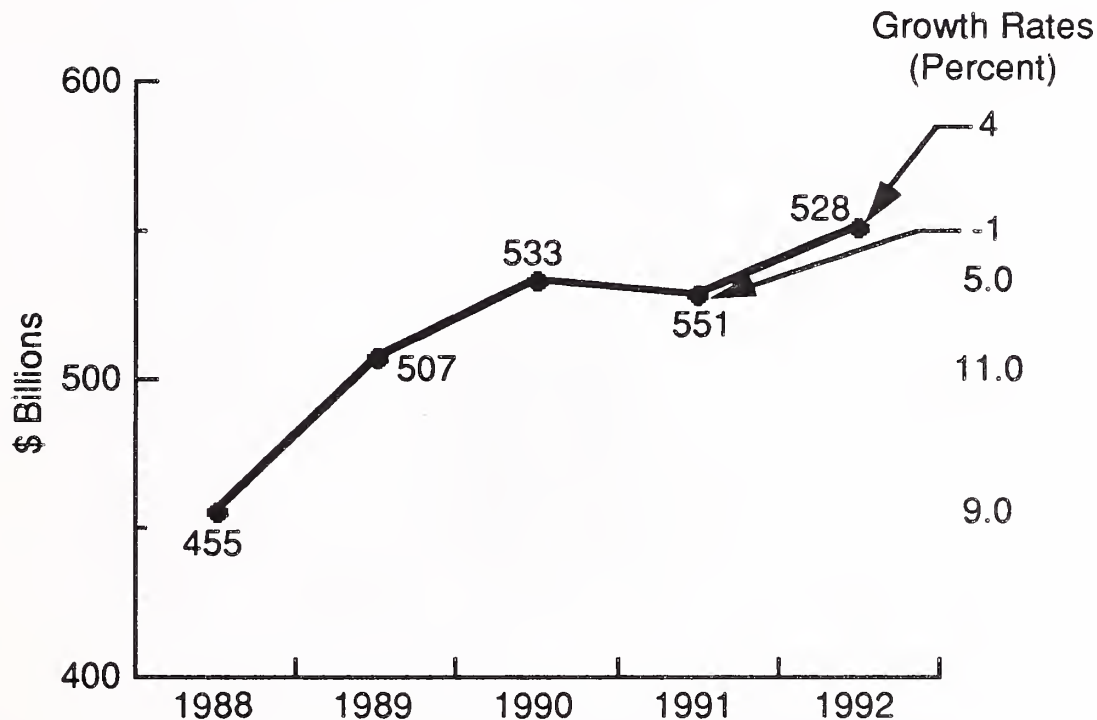
Several factors, discussed in the next section, drive the systems integration market. The prime mover, however, is the availability and commitment of funding with which to implement information system solutions.

Overall capital investment in plant and equipment is one indication of the ability of U.S. industry to fund SI programs. Between 1990 and 1991 this investment decreased from \$532.6 to \$528.4 billion, about a 1% decrease. Based on 1992 quarterly data, the U.S. Department of Commerce is forecasting this investment to increase to \$551.0 billion, a 4% increase. This represents a total increase over the last two years of only 3%.

These numbers, shown in Exhibit III-4, are significant to the information industry. Because about 3% of capital investment goes toward information systems additions and improvements, decline in capital investment growth translates directly into less investment for new systems integration programs in the private sector.

EXHIBIT III-4

U.S. Industry Capital Investment Trend

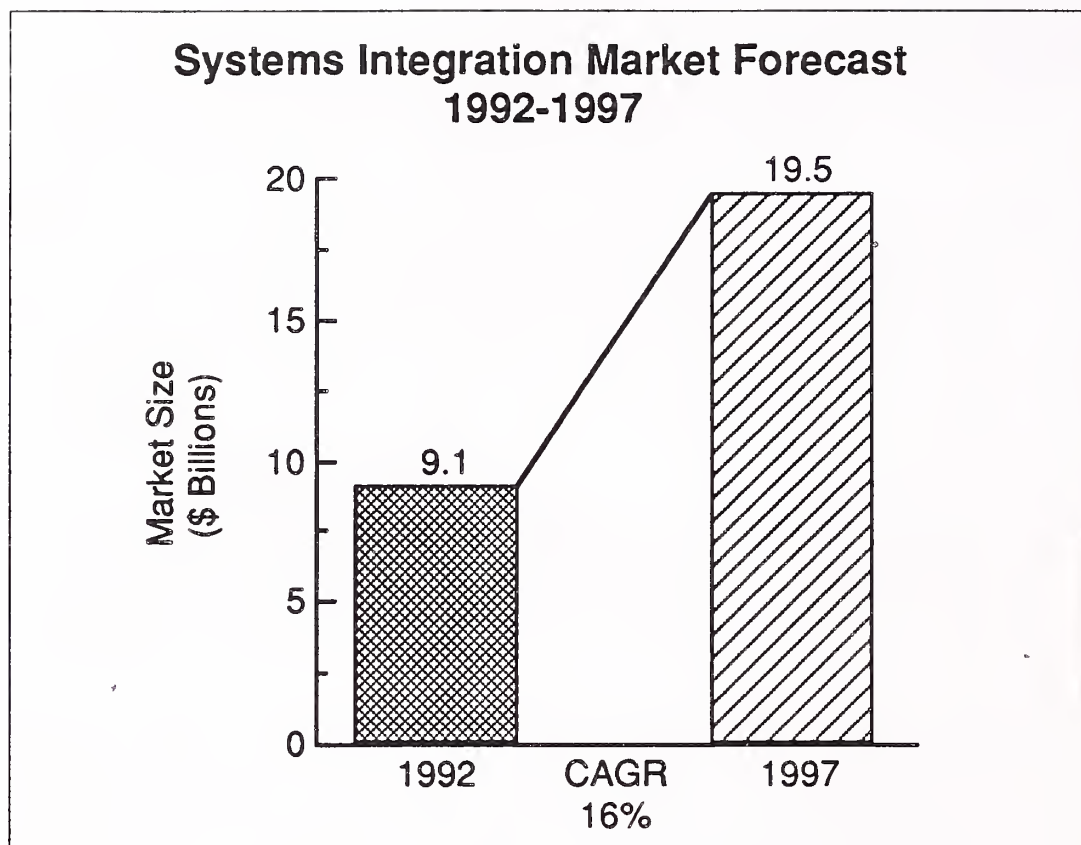


Source: Sept. 1992 U.S. Department of Commerce

The U.S. federal government continues to invest in data processing and communications products and services. The need for productivity continues despite ever-increasing concerns about budget deficits and rising costs. The federal information technology budget represents about 1.6% of the total national budget, and continues to grow at nearly twice the rate of the national budget.

Based on these changes, INPUT forecasts SI contract expenditures of \$9.1 billion in 1992 for the combined commercial and federal market. Growing at a compound annual growth rate of 16%, annual SI contract expenditures will reach \$19.5 billion in 1997, as illustrated in Exhibit III-5.

EXHIBIT III-5



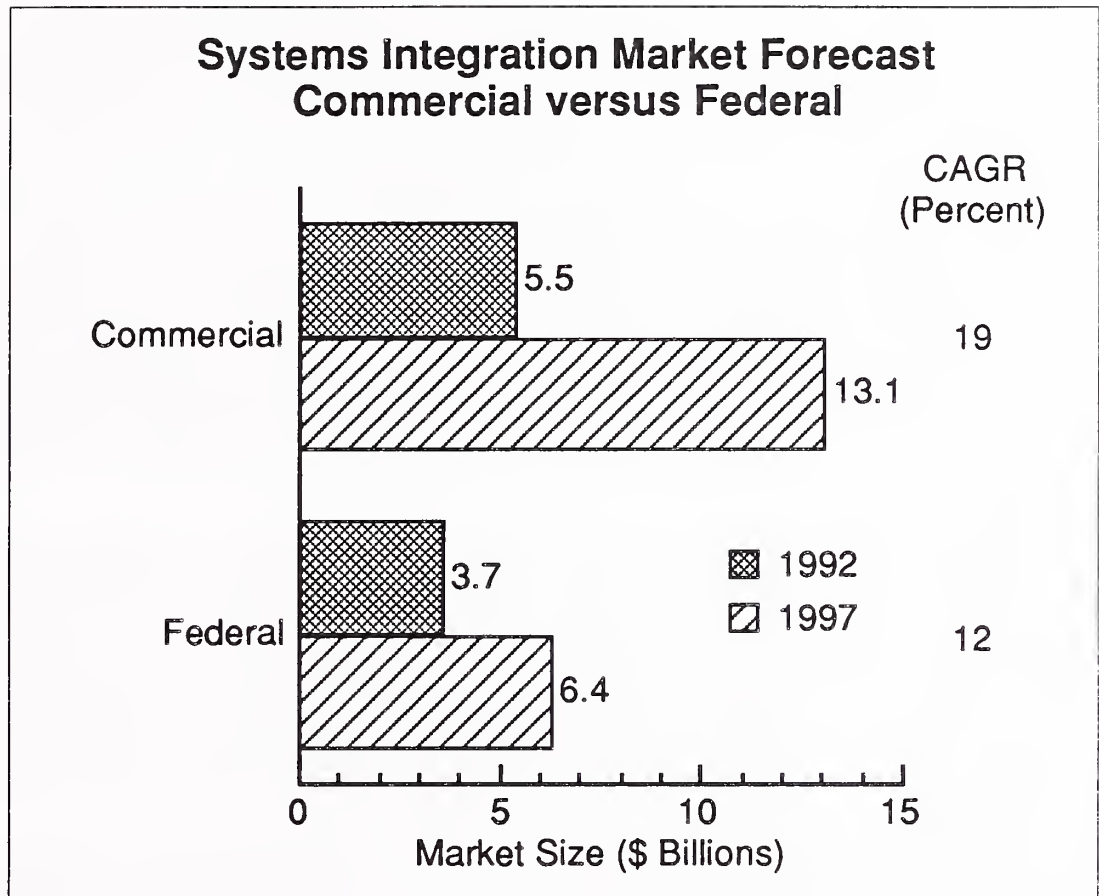
1. Commercial versus Federal SI Markets

The commercial and federal SI markets continue to be influenced by changes in the economy and by business' and government's ability to pay. The 1991 commercial market expenditures were somewhat more (4%) than forecasted in 1990, and because the long-term market size has been dampened as a result of reduced near-term spending, the 1996 market forecast has been reduced by 4%.

User organizations, particularly in manufacturing and distribution, will be reducing projected expenditures over the forecast period, although industry growth rates will still be substantial. The insurance and banking and finance industries will also experience a slowdown in SI expenditures owing to financial strains caused by the decline in real estate values and increases in regulatory requirements. These impacts will be described in more detail in Chapter IV.

Overall, the commercial SI market is now forecasted to reach \$13.1 billion in 1997, as shown in Exhibit III-6. The commercial SI compound annual growth rate (CAGR) will be 19% for the 1992-1997 forecast period. This CAGR assumes a somewhat modest growth rate of 11% to 13% for some sectors as the economy recovers over the next one to two years and the market recovers near the end of the forecast period.

EXHIBIT III-6



Despite budget constraints and criticism of so-called grand designs, the federal systems integration business continues to thrive. This success reflects the continuing need of many agencies for system solutions rather than merely hardware and software components. FSI vendors continue to thrive in this market. The success of technology in the recent war has enabled the DoD to acquire higher information systems (IS)-related funding.

Some recent awards include:

- Reserve Component Automation Systems (RCAS) to Boeing—Phase II for \$23.2 million and potential Phase III to \$1.6 billion
- Naval Oceanographic and Atmospheric Research Laboratory Large Scale Computer System to Grumman for \$205 million
- Air Force Management Information Systems Technical Support (MISTS) to CSC for \$180 million
- FAA Computer Resources Nucleus (CORN) to EDS for \$508 million
- IRS integration support contract to TRW for \$300 million

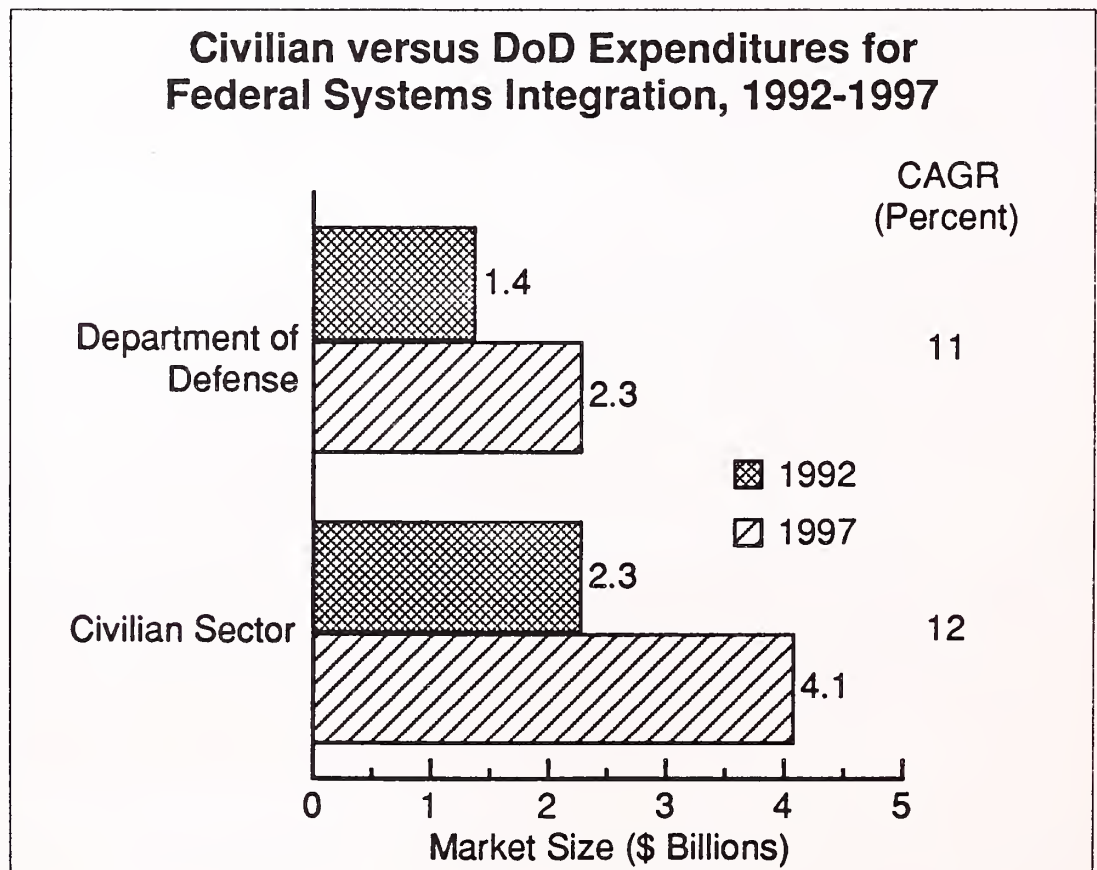
Despite the criticism of the large, long-term, grand design SI programs, this year's awards are larger than ever. SI has proven to be a very effective way for the government to acquire complete, fully functional, mission-critical systems.

The procurement process, rather than budget cuts or grand design criticism, represents the biggest threat to federal systems integration. Some agencies, including NASA and Treasury, have been plagued with protests on virtually every major procurement. These protests delay either contract awards or contract implementation, thus increasing both government and vendor costs. However, most major federal integrators are in the market for the long haul, recognizing the definite rewards available as well as the pitfalls.

Despite the above factors, the forecast for federal systems integration has remained constant compared to INPUT's 1991 forecast. Expenditures for 1992 are estimated at \$3.7 billion, growing to \$6.4 billion in 1997; this represents a reduction from \$6.9 billion. The federal SI growth rate has been reduced from 16% CAGR to 12%. This consolidated federal growth rate includes an increase in civilian agency spending growth and a decrease in DoD spending growth.

However, as a result of technology's role in the successful war, DoD spending continues to grow but at a slower rate than the civilian sector, as shown in Exhibit III-7. INPUT doubts, however, that it will equal civilian SI spending for the foreseeable future.

EXHIBIT III-7



Spending in 1992 by civilian agencies is almost twice the DoD's and is expected to reach \$4.2 billion in 1997. A number of large multiyear civil systems are being implemented for the FAA, IRS, Military Reserve System, and Social Security System. Large outlays are planned for replacements for Justice and Treasury systems in the next five years, which will sustain the projected 12% CAGR. Office systems, graphics systems, CALS and on-demand publishing systems are proposed in defense program expenditures, which will be sustained despite cuts in weapons and platform procurement outlays. Finally, there is a major push for common information systems across all military branches through the Corporate Information Management (CIM) initiative. This should provide significant defense SI opportunities over the long term.

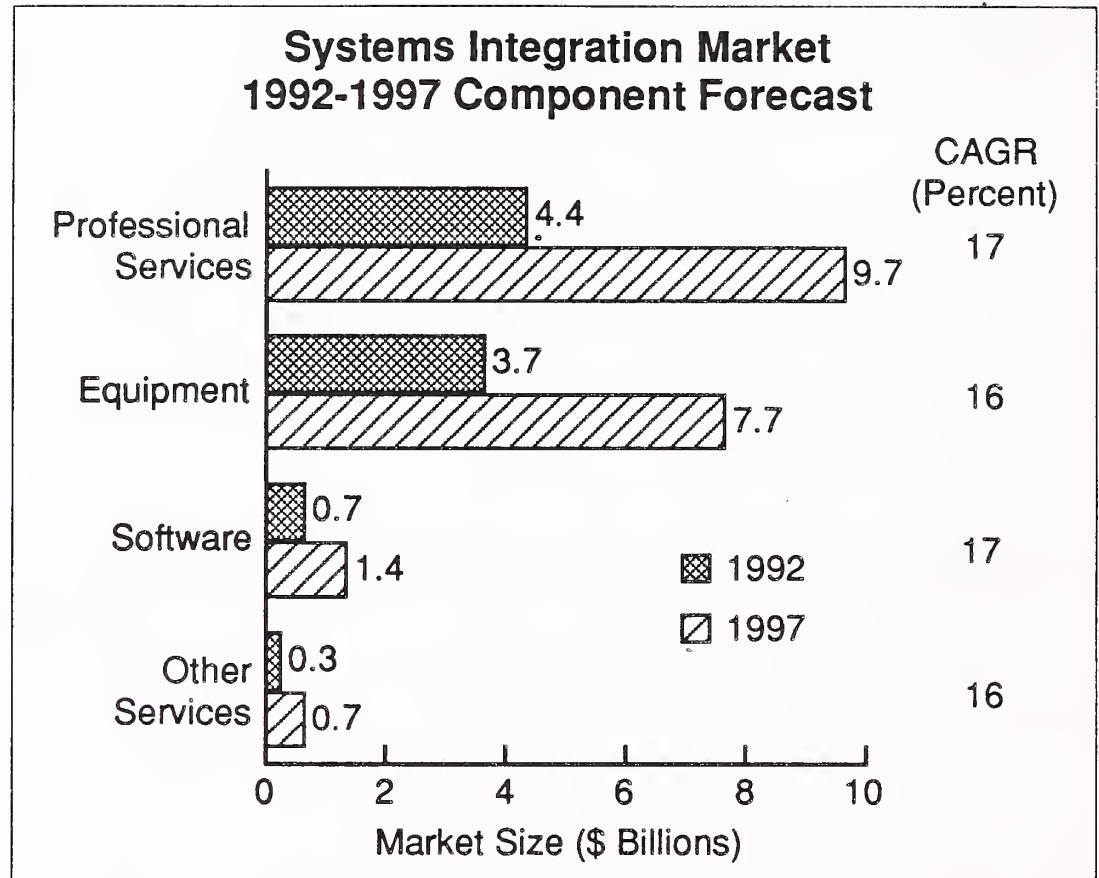
DoD has committed to Congress that CIM will result in significant savings. These savings have not been realized. As a result, DoD is now evaluating very large-scale consolidation of all DoD data processing. Because of the uncertainty created by this proposal (DMRD 918), several major contracts are being delayed. INPUT estimates that over the forecast period this type of consolidation will create more opportunity for SI programs. As part of the CIM initiative, DoD has identified SI program management as a core competency to be developed and retained. DoD certainly can provide the funding for this training and has a significant number of challenging projects in need of quality management. INPUT believes that the need for qualified program managers in business and industry by vendors and clients will drive a constant migration. It will be very difficult for DoD to retain this core competency.

2. SI Component Forecast

Expenditures by component group appear in Exhibit III-8. The distribution of component spending in the separate commercial and federal sectors is illustrated later in Exhibits III-10 and III-11.

The professional services and equipment components dominate the spending for systems integration—with professional services expenditures leading at \$4.4 billion in 1992. In the professional services component, software development is the predominant service required, although SI clearly requires the other components: consulting, project management, design/integration, education and training, and operations and maintenance. The additional elements of the four components, listed earlier in Exhibit III-1, will be briefly discussed below.

EXHIBIT III-8

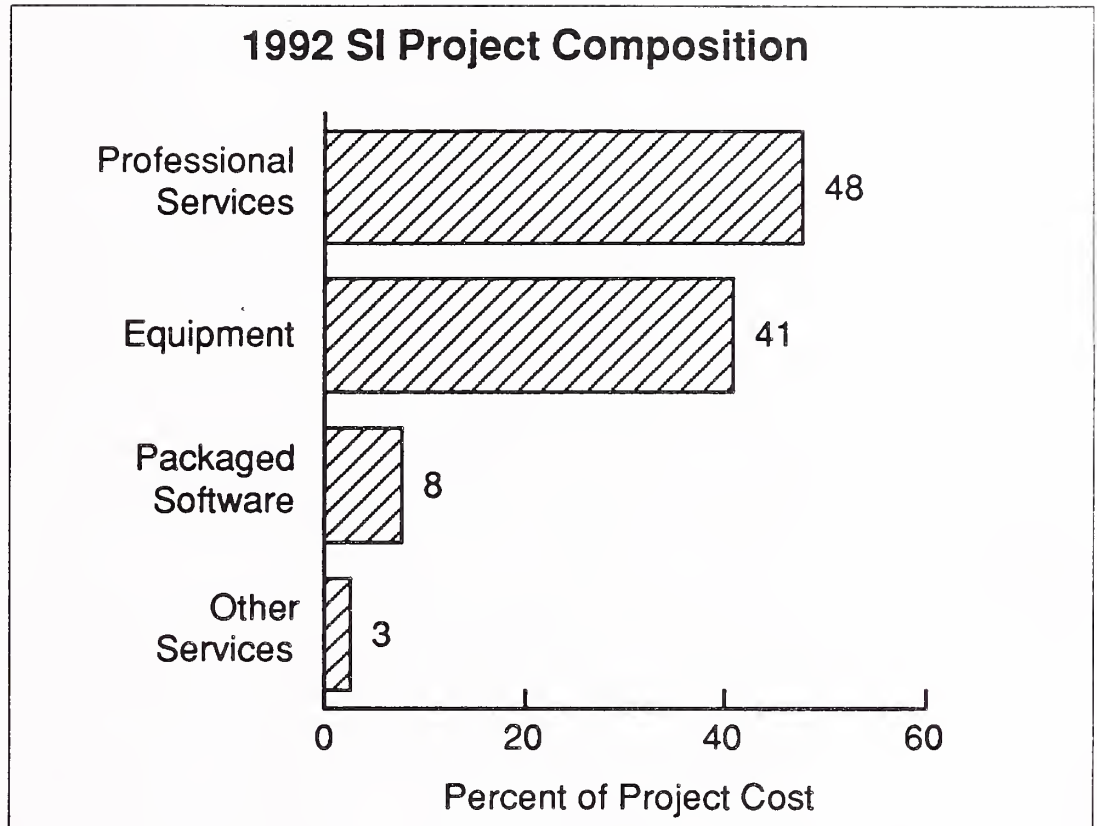


a. Equipment

Information systems and communications equipment is currently the second largest component of SI expenditures (41%), as shown in Exhibit III-9. This is not expected to change. By its very nature, SI is equipment intensive. Hardware price/performance gains that would seemingly reduce the hardware component will be offset by productivity improvements in programming technology and the increased use of packaged software, particularly in the private sector. The percentage of project expenditures attributable to equipment has increased from 36% in 1991. This is heavily weighted by a higher percentage of government expenditures (47%).

Some projects may require special purpose computer- and communications-related equipment (vector or array processors, RISC machines, or specially designed workstations), but this should not have a material impact on the overall allocation for standard equipment. Discrete manufacturing, state and local government, utilities, and banking/finance are the leading industries in hardware expenditures.

EXHIBIT III-9



The SI equipment category excludes custom turnkey systems. Communications equipment and software are included. CSI projects, because of their inherent risk, are rather conservative in nature. Leading-edge technology is avoided, in many cases. Many companies consider technology to be a very low priority when considering integration projects.

An equally important development is the transition from cable and wire to optical fiber, and the addition of computer-based network monitoring and management systems. Discrete manufacturing, banking/finance, and state and local government, respectively, are the leading industries in communication equipment expenditures.

New (telecommunications-based) applications continue to grow. Electronic data interchange (EDI), electronic mail, teleconferencing, telemetry applications (remote diagnostics and meter reading), new consumer-oriented applications in point of sale, and credit card authorizations head the list of applications that require adaptive technologies combining the utility of point-to-point communication with application-specific communication requirements.

b. Professional Services

The largest ingredient of SI projects is professional services, the value-added component that adapts hardware and software to the task assigned. In earlier forecasts these services were a smaller component than equipment, but professional services now is clearly leading and will continue to lead, as shown in Exhibit III-10.

Professional services now represents 48% of total SI expenditures, down from 53% in 1991. This reduction in the percentage of expenditures going for professional services can primarily be attributed to increased productivity. These improvements are the result of increased usage and improvement in automated software development tools (CASE), software re-engineering, reusable software modules, repeatable applications, improved off-the-shelf software, and improved program management tools.

In the vertical markets, expenditures are more a function of the overall level of CSI activity in the industry. Discrete manufacturing firms account for the most professional services expenditures. Other industries with large professional services expenditures include, in descending order, state and local government, utilities, banking/finance, retail distribution, and health services.

Consulting services are frequently a precursor to systems integration programs. Overall planning assistance, feasibility studies, and cost-effectiveness/trade-off studies guide the client in planning for the desired solution. Consulting services can also support vendor sales through in-depth knowledge acquired during the consulting engagement. Some clients separate consulting from program implementation, whereas others do not. Some clients use consultants to aid them during program development and implementation.

Fees are paid to the integrator for planning, scheduling, and controlling the materials and human resources required for the execution of the program. Program management (PM) involves the coordination of complex activities to meet time, cost, resource allocation, and performance targets. It also involves reporting on these activities to keep the client informed of progress.

Management fees compensate the SI contractor for assuming the risks involved in guaranteeing the success of the solution. Again, discrete manufacturing leads in PM expenditures, followed by state and local government, utilities, and banking/finance.

Another role of the integrator or one of its subcontractors is the actual technical integration of the system's components. Design/integration services include systems design, integration of computing components, installation, and client acceptance tests of the data processing and communications systems. As noted earlier, discrete manufacturing is the leading industry in expenditures for this subcomponent.

The development of new custom software, the conversion of existing software, and the modification of commercial software packages are key professional services. Though the work is essentially programming and analysis, it occasionally includes independent verification and validation of the new system and software maintenance of that system for a specified period of time.

The level of these services varies between industries, but the leaders now are discrete manufacturing and state and local government. Banking/finance and utilities follow—at a much lower level than discrete manufacturing and state and local government.

Education and training of the client staff on operation of the system, and full documentation of the system's operation and maintenance, are also critical to the success of the project. Overall expenditures in this category are low, however, because hardware vendors provide many of these services on a customer service basis, built into the component prices.

Some major projects include a requirement that a vendor operate and maintain the developed system for a specified period of time. Under some contracts, the maintenance is under warranty for a defined period. Under others, operation and maintenance is a specifically negotiated arrangement that covers the transition of the system from the vendor(s) that built it to the client who will use it, or the vendor will operate it for a predetermined period of time. These contracts ultimately can lead to follow-on systems operations contracts.

c. Software Products

Packaged software does not represent a major expenditure in most CSI programs. While IS managers have been demonstrating a propensity to buy packages rather than pay for unique custom development of software, CSI programs, by their nature, preclude extensive use of these packages.

As indicated in Exhibit III-8, software package expenditures will grow at a CAGR of 17%. However, as seen in Exhibit III-9, the annual expenditure for packaged software will continue to amount to only 8% of the total commercial SI expenditure.

SI programs focus on applications rather than the computer environment in which those applications will run. Accordingly, applications software is expected to outpace systems software throughout the forecast period. SI programs are typically focused on core business areas (market support systems, product development and manufacturing, inventory management, customer service, etc.) and are targets for the development of applications software that can be customized to meet specific customer needs. INPUT believes, however, that SI prospects will continue to reject packaged applications as not able to meet their unique needs.

The use of network applications software will continue to grow. Although some customization will occur, the majority of SI programs will use packaged network software as a starting point. SI programs are becoming less likely to use networking software provided by computer equipment vendors and are increasingly turning to the network equipment vendors and independent network software providers.

The leading industries in software product expenditures are discrete manufacturing, state and local government, and banking/finance. The utilities and health services industries will spend the largest portion of program costs on packaged software.

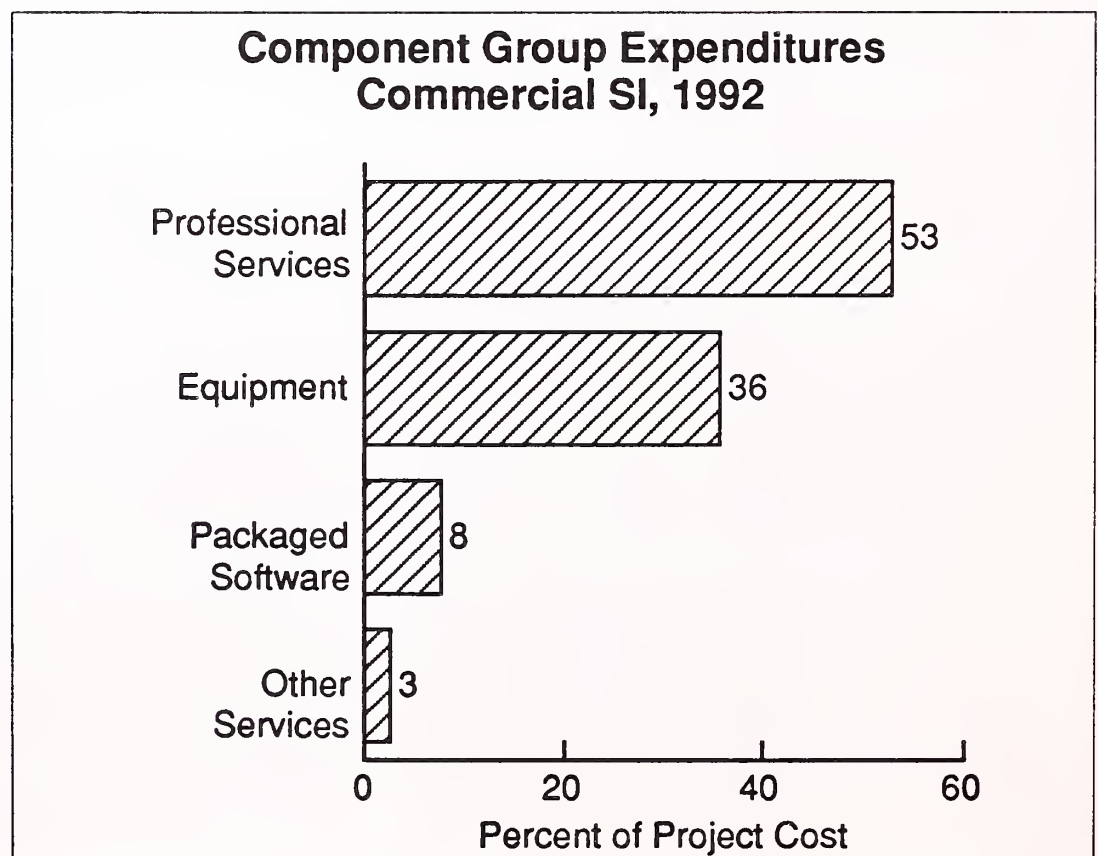
d. Other Services

Most projects include other product and service expenditures that are not easily classified elsewhere. This category includes miscellaneous items such as engineering services, automation equipment, computer supplies, business support services and supplies, and other items required for a smooth development effort. Processing and network services and communications services that may be required during the course of development are also included in this category. Other than the federal government, the leading expenditures for this component will come from discrete manufacturing, state and local government, banking/finance, and utilities. Spending for the federal sector will remain at 3% of the total composition over the forecast period.

e. Component Group Expenditures—Commercial versus Federal

As shown in Exhibit III-10, professional services at 53% makes up the largest component and will not change during the forecast period. All other components of commercial SI will also remain constant. As mentioned earlier, there will be some gains in the acceptance of replicatable software frameworks and packages, although custom programming will remain the source of the majority of SI program development.

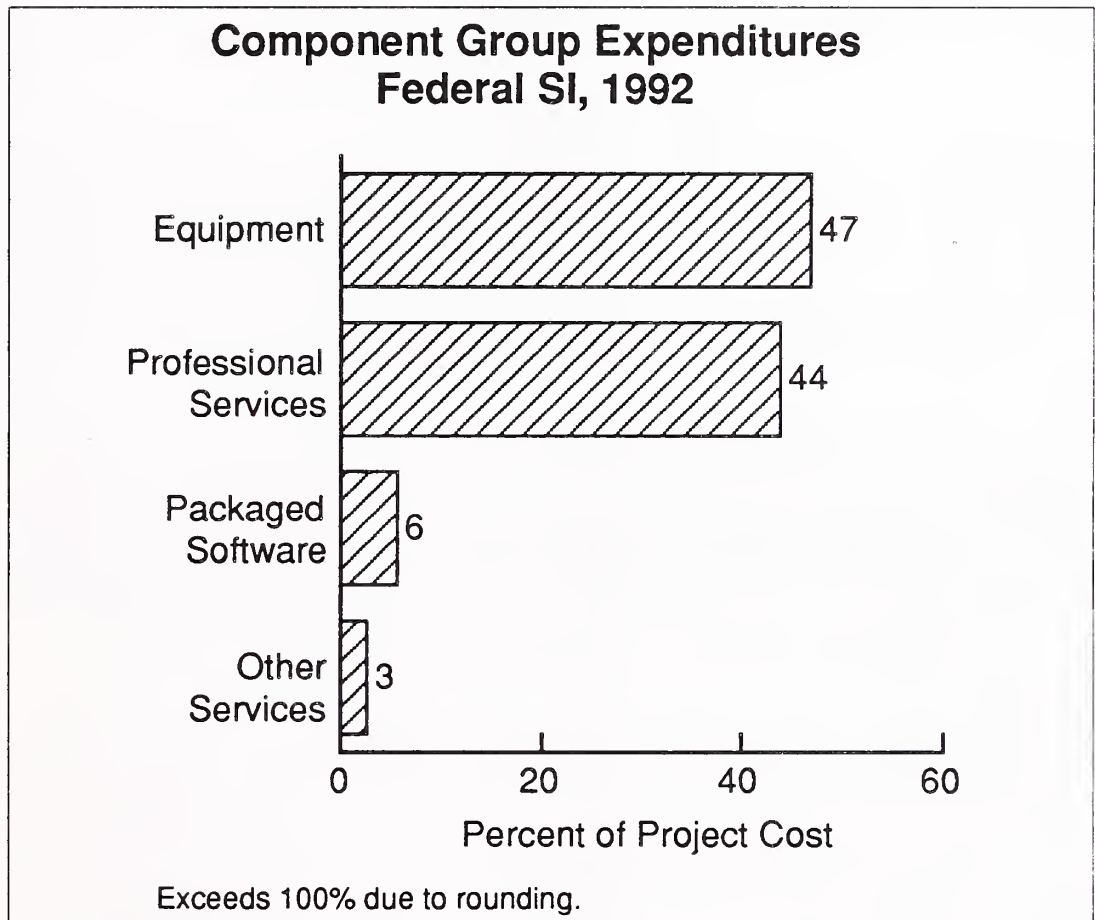
EXHIBIT III-10



In the federal market, component expenditures are distributed somewhat differently, as shown in Exhibit III-11. Equipment expenditures lead at 47% in 1992.

The software component in the federal market is smaller than in the commercial market, primarily in the applications software area. Federal business processes are different enough from commercial ones that, in many cases, applications software developed for commercial organizations are not transferable to federal organizations.

EXHIBIT III-11

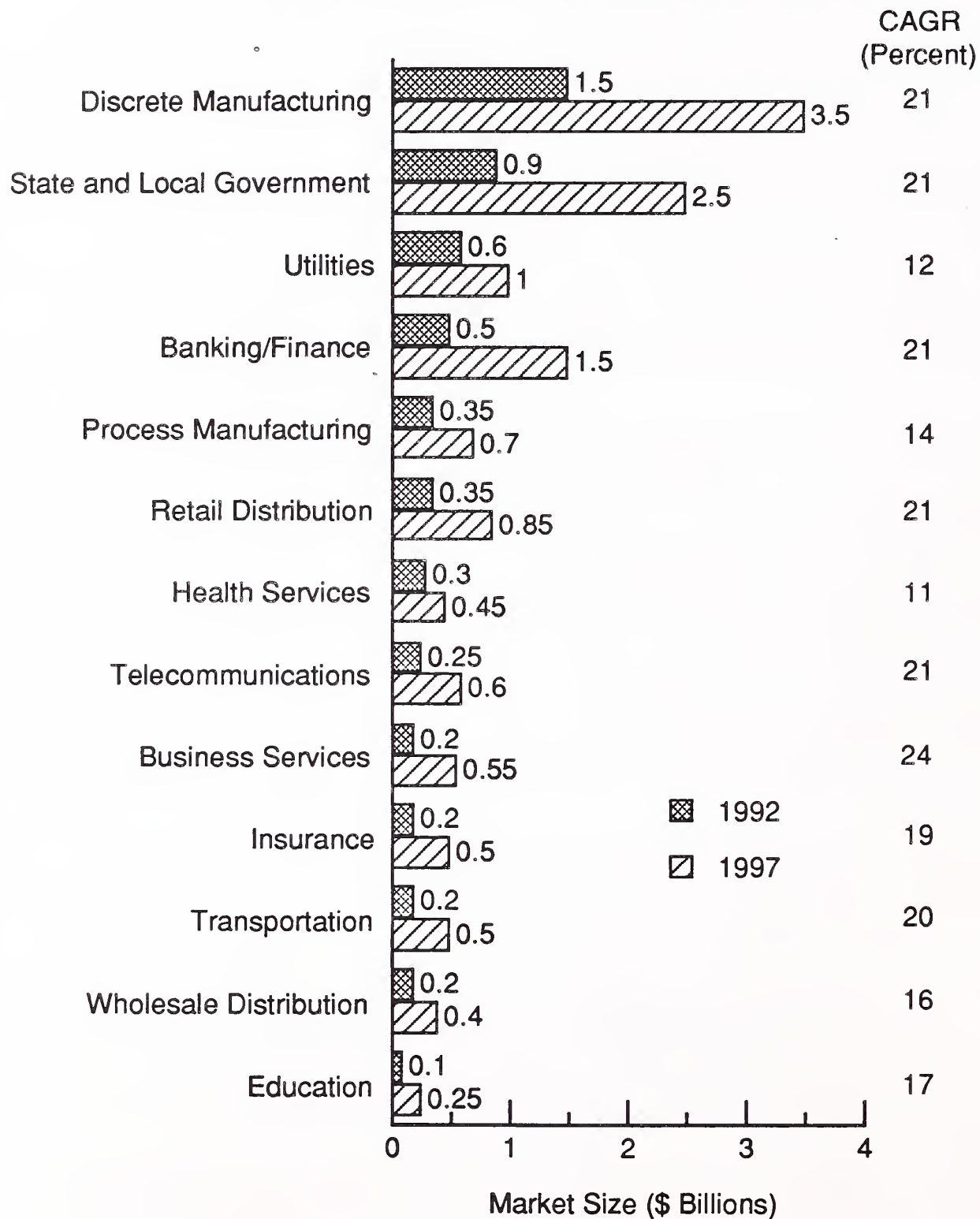


3. Forecast by Industry

The annual expenditures over the forecast period in the federal government market will grow from \$3.7 billion in 1992 to \$6.4 billion in 1997, at a CAGR of 12%, as shown earlier in Exhibit III-6. Breakdown of the forecast by key agencies and major projects is provided separately in INPUT's report, *Federal Systems Integration Market*.

The annual expenditures by commercial vertical industry market for the same forecast period are displayed in Exhibit III-12 and examined by component expenditures and key opportunities in Chapter IV of this report. The top three industries—discrete manufacturing, state and local government, and utilities—account for close to half of the total commercial systems integration expenditures over the forecast period.

EXHIBIT III-12

Annual CSI Expenditures by Industry, 1992-1997

Ranked by growth the leading industries are business services, discrete manufacturing, state and local government, retail distribution, and telecommunications. The combination of a higher base and a rapid growth rate expands discrete manufacturing's absolute lead over the second and third largest markets—state and local government and utilities. It is important to note that discrete manufacturing, business services, and retail distribution will be very sensitive to any further deterioration in the economic picture.

C

Key Marketplace Factors

From the vendors' point of view, systems integration projects represent new or additional opportunities for revenue. SI opens new distribution channels for the sale of products and services. Prime contractors gain additional income from fees for managing the entire program and the work of subcontractors. This income includes markups on products and services. Some vendors also receive revenues and profits from the add-on effort of operating and maintaining the systems after implementation.

A close business relationship develops between the integrator and the client and increases the integrator's understanding of the client's business needs. This involvement can assure the integrator an inside track for providing future software and services, including some not related to the SI project. Development of this close working relationship is a key element in a successful SI engagement.

Strategically, the SI client may be a different class of buyer for the vendor. With decision making placed higher in the client's executive business management and the user organizations, the vendor must increase exposure at all levels in the client's organization. Clients typically need to be sold on the vendor's knowledge of the client's business problem and proposed solution, the vendor's overall capabilities, and its experience and success in implementing complex systems integration projects. Industry knowledge is absolutely essential.

This section explores the key advantages and obstacles—current and future—to vendors in the SI market, from the perspectives of clients and vendors.

1. Key Commercial SI Market Factors

The development of major systems by integrators has been common practice in the federal government sector for more than thirty years. The commercial sector began to use outside vendors for integration only in the last few years and now this market is growing rapidly.

There are both positive and negative factors affecting the growth of the systems integration market. These factors are outlined in Exhibit III-13. INPUT believes that the positive factors will clearly outweigh the negative ones and forecasts that the market will expand over the next decade.

EXHIBIT III-13

Key Commercial SI Market Factors

Positive

- Rising demand for connectivity
- Major rebuilding of infrastructure
- Growing user/client involvement
- Computer literacy
- Global competitive pressures
- Growing complexity of applications

Negative

- In-house competitive threat
- Poor economy
- System maintenance concerns
- Capital availability
- Organizational instability

On the positive side, the most significant factor is the rising demand for connectivity between business elements, trading partners, customers, and sources of supply. In addition, SI addresses incompatibility among various vendors' equipment and protocols and provides cost-effective solutions and implementation of network management systems when needed.

The time value of information has become as critical to business as the time value of money. An important information systems management focus is the rebuilding of major network and data infrastructures to provide the flexibility and capacity to satisfy new user requirements for business support systems.

The growth of global markets and competition is forcing business to improve its ability to operate in real-time mode around the clock and around the world. Most business systems cannot meet the requirement of

continuous operation. New solutions to cope with new problems require tools and technologies that were prohibitively expensive or beyond the scope of equipment and applications that are just a few years old.

Many SI programs today involve downsized or client/server architecture. These applications place more computer capability and technology closer to the source and use of the data. The growth of computer literacy in the general work force is enabling the use of these technologies.

Some basic attitudes hinder the implementation of integrated systems. In some major organizations, corporate management views the in-house staff as qualified and sufficient to plan and execute important information system improvements. Although some organizations do have the skills to implement complex systems, many are overloaded with the maintenance and operation of existing applications and/or lack the skills to integrate new technologies or implement advanced applications.

The recession impacts decisions to start new development projects, particularly when these projects require significant capital expenditures. Many companies decide to cancel or delay previously planned programs until there is more economic certainty. Though cancellations and delays will affect near-term SI opportunities negatively, they will most likely result in a backlog of opportunities when the economy recovers.

Also detracting from a decision to employ a systems integrator is the concern about maintaining software programs developed by others. Although this might have been a concern in the past, years of professional services experience and proven documentation techniques should override this consideration. In addition, many integrators provide ongoing maintenance and systems operations.

SI programs often represent major capital expenditures by the clients. Although steadily declining interest rates have reduced the cost of capital, there has been a general reduction in the availability of capital. Fast growing SI vendors also have the requirement to internally fund their own growth. The larger SI vendors find themselves in the position of financing systems their clients are having them install.

Organizational instability, the bane of many medium-sized and large businesses, can delay plans to upgrade or replace existing data processing resources indefinitely. Similarly, once an SI engagement is started, organizational change can have a negative impact. Wait and see attitudes are likely the most difficult obstacle for vendors to overcome.

2. Key Federal SI Market Factors

Systems integrators have found advantages to working with the federal government that outweigh the many unique and difficult practices and competitive stresses. These positive and negative factors are outlined in Exhibit III-14. With little or no information resources management (IRM) staff growth, agencies look to industry to provide the answers—and systems—to help satisfy steadily increasing demands. The agencies specify details of the solution and employ a variety of monitoring practices. The government shares implementation risk with the vendors.

Federal policies and regulations play an important role in the systems integration market. The Competition in Contracting Act (CICA), the Paperwork Reduction Act, and the Procurement Integrity Act have all had an influence on large systems integration procurements.

Many government agencies have undergone several stages of automation. Often the installed systems are antiquated. In the past, these systems would simply be replaced with systems with more capacity. Now the government is more likely to use an SI vendor to completely redesign the entire system. There is a trend in the government to use newer technologies such as image processing, client/server, interconnected LANs, and fiber optics to improve system functionality.

There is a strong groundswell among voters to hold Congress and government agencies more accountable. In turn, Congress and the Office of Manpower and Budget (OMB), using their budget authority, review authority, and oversight agencies are urging individual agencies to embrace new technologies to improve productivity and service to the public.

Software integration and productivity improvements have an impact on the federal systems integration market. As new hardware technologies are put into place, the next generation of software must accommodate change and communication between incompatible equipment. Agencies are increasingly required to merge large applications into a single, transparent software system that fits their users' needs.

The cold war is over. This realization is causing a major shift in government priorities and expenditures. Military spending, especially for strategic systems, will continue to decline. More attention is being paid to the needs of the civilian agencies.

EXHIBIT III-14

Key Federal SI Market Factors**Positive Impacts**

- Productivity improvement demand
- Shortage of technical staff
- Trend toward technology upgrades
- Accountability
- Software integration
- Commercialization

Mixed Impacts

- Deficit and budgets
- Changing priorities
- More hardware/fewer professional services
- Fewer "mega contracts"

Negative Impacts

- Extended implementation schedules
- Corporate information management initiative
- System maintenance
- Adversarial posture

Systems integration procurements are both fueled and delayed by budget constraints. The constraints tend to enhance prospects for vendor services as opposed to the government providing services through its own in-house resources. However, budget constraints also often delay SI initiatives.

In the last year the world geopolitical situation changed dramatically. The magnitude of this change was not anticipated, even by INPUT. The result has been a realization that the federal government could make major shifts in program emphasis. In the short term, this will result in the delay and cancellation of some SI programs, primarily in DoD. In the long term,

there will be an increase in SI opportunities related to entitlement programs, law enforcement, and other domestic assistance programs.

As INPUT previously reported, the federal systems integration market was becoming more active, competitive, and controversial. This is still true. In terms of activity, many additional agencies have started to define requirements in SI terms. In terms of competition, practically all major federal vendors now claim past or present SI experience, or future capability.

In terms of controversy, there is an issue now being discussed that goes to the heart of the SI concept.

General Services Administration (GSA) argued that the larger a project becomes, the more obstacles it encounters. The GSA report, "An Evaluation of the Grand Design Approach to Developing Computer-based Application Systems," listed the negative factors. The trade association Information Technology Association of America (ITAA), working with SI vendors, drafted a response supporting the SI approach to designing the entire system. In reality, major large-scale contracts are still being awarded. The concept of requiring a single contractor to be responsible for the delivery of a complete system is very attractive to the government.

No matter how good a procurement job the government agency does, all awards are subject to protest, and many are protested. The protest process adds to vendor bidding and proposal expense and delays contract award and revenue flow.

Similarly, Government Accounting Office (GAO) audits and congressional inquiries can delay or derail a procurement any time. This is particularly true for large "megacontracts" that have a great deal of exposure and publicity. In view of the concern over grand design and megacontracts, some agencies will likely compromise with a top-down grand design and a bottom-up modular implementation. This approach can dampen federal systems integration growth rates, especially if more agencies buy information systems capabilities a piece at a time.

Some government agencies are concerned about the continuing need to use a contractor to maintain and manage a mission-critical system. In government SI engagements, vendors must directly address in detail the entire process of turning the system over to the government.

INPUT's report, *Methods for Successful Systems Integration*, identified the potential for an adversarial relationship in any SI engagement. This potential is much greater in the government. Many of the opportunities to establish a working business relationship prior to starting work are preempted by the procurement process. Both the vendor and client are subject to a wide variety of rules, regulations, and laws in addition to various levels of oversight and audit.

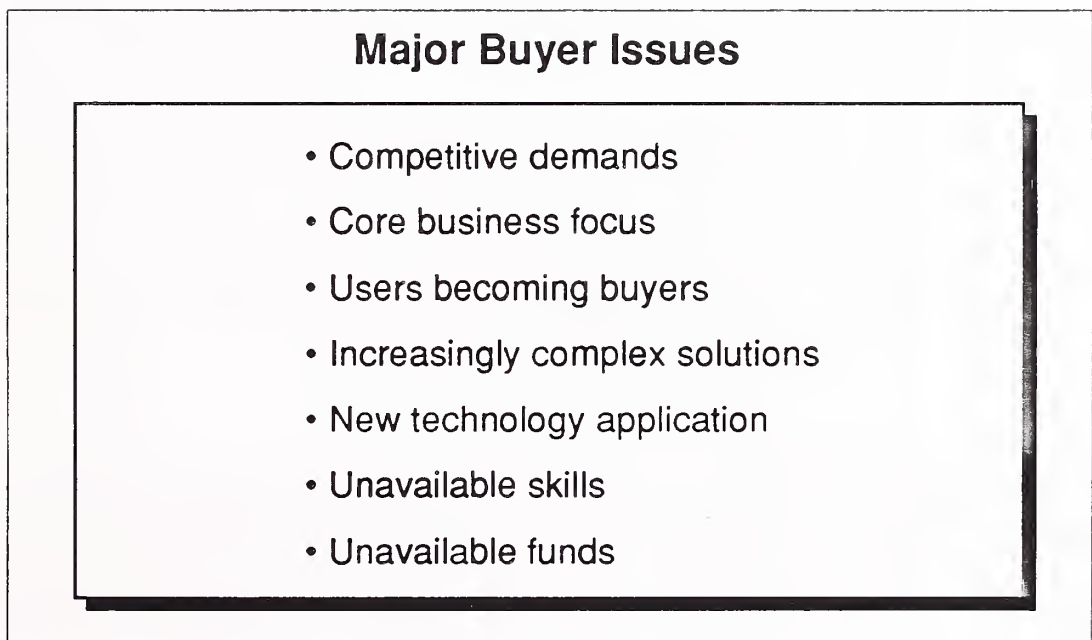
3. Major Buyer Issues

Earlier surveys conducted by INPUT produced a variety of client reactions to contracted systems integration projects. The research confirmed rising management expectations in many industries. Some executives brushed aside in-house proposals and contracted for major solutions. The objective was to get the system on-line early and with minimal modification. Users wanted systems that performed functions for them without direct involvement of the IS staff.

Corporations want information executives (Chief Information Officers) to manage the technology investment and oversee building of new systems. The more astute IS managers recognize the urgent need for infrastructure integration in order to provide capable platforms for supporting new demands. Businesses also identified moving from general data processing to decision support and control systems as an appropriate competitive advantage.

Though these buyer issues still hold true, there are a number of other related issues, shown in Exhibit III-15, that have become apparent. U.S. business continues to feel the pressures of competition from both domestic and foreign companies.

EXHIBIT III-15



These competitive pressures are forcing organizations to look closely at their core business to identify business solutions that can differentiate their products and services from the competition. In many cases, the application of technology can make the difference in offering a superior service faster or reducing the length of product development cycles. These solutions are increasingly complex, as they change business processes and often are required to operate worldwide.

As INPUT studied information systems budgets, it found that an increasing amount of information systems expenditures are no longer controlled by internal IS organizations. User organizations are clearly becoming the buyers of IS solutions and controlling the budgets for these solutions. Many of the solutions user organizations seek include new technologies such as artificial intelligence, image processing, and a variety of the advanced telecommunications alternatives such as LANs, WANs, and MANs.

Systems integrators with good track records provide an attractive alternative to internal IS organizations, which often lack adequate resources and skills to meet users' requirements. Some of these internal organizations also lack application knowledge and experience in the solutions that are sought.

This lack of appropriate skills can also have an impact on the SI vendors. The client needs to have a qualified program manager to act as the main point of contact for the vendor. The client also needs to develop the appropriate receptor organization to take responsibility for the system as it becomes functional. The lack of these skills can result in an SI engagement becoming an ongoing systems operations contract.

Although an SI program may be completely justified through detailed financial and business analysis, an organization may simply not be able to afford it. More vendors are recognizing the need to create financing structures to help clients initiate SI programs. This has an additional benefit in that vendors are unlikely to finance systems that they do not strongly believe will achieve the desired business improvement.

These trends continue to provide opportunities for SI vendors and support significant growth for this delivery mode. Failure to perform is the major factor that can slow acceptance.

4. Major Vendor Issues

A key concern is the ever-present potential of catastrophic failure, eventual litigation, damaged image, and rising liability insurance premiums. Coupled with this concern is the all too frequent resistance to change from in-house integrators, who perceive the vendor as an interloper in their territory.

There is also a great deal of concern regarding the desirability of alliances and how to operate effectively with other vendors who are allies one day and competitors the next. The largest SI vendors have very formal and structured business partnership programs. Some vendors financially invest in the companies that are their strategic partners. The successful SI vendors have developed strong subcontractor management processes. Research indicates that the entire process of managing subcontractors on an SI program is a key vendor issue.

The new trend toward small and modular SI programs is allowing the entry of some smaller and more focused competitors. INPUT has identified over 100 smaller SI companies with business under the \$50 million level. Medium-sized to large SI vendors also have serious reservations about introducing leading-edge technology in projects and risking increased project delays, cost overruns, or nonperformance of stated specifications. Conversely, it is the need for those very leading-edge technologies that often cause the client to turn to an SI vendor.

A number of vendor issues are identified in Exhibit III-16. Systems integration has become an increasingly popular service offering, for many of the reasons described earlier in this report. Vendors recognize the importance of this channel for the delivery of their products or services. With this recognition comes the need to establish the basic resources to compete effectively, either independently or through consolidation or alliances with other vendors. If the skills are provided internally, attracting and retaining qualified personnel—particularly qualified program managers—is a problem. These individuals have the unique skills to manage successful installations; without them, vendors' risk of failure increases. As a result, there is a great deal of competition for qualified SI personnel.

When the SI market was new, it was relatively uncrowded. With the recognition that SI is an important delivery channel has come a wealth of new market entrants, and the competition for clients has heated up.

There is an emerging trend in the market for large vendors to become "full-service providers" with complete offerings from front-end business process consulting through systems integration to follow-on systems operations. Full-service offerings allow a vendor to capture a client through the entire development and operations cycle. One fundamental issue that vendors must address is how to compete effectively in a market that appears to be moving toward the full-service provider.

The role of business process consulting in systems integration is worthy of additional comment. As users focus on their core business and solutions to improve their competitiveness in their markets, they often seek business consultants to assist them in changing their business processes. To achieve the maximum benefit of integrating new technologies, it is often necessary to change business processes.

The consultants' recommendations often lead to SI programs and contracts. There is a growing belief and recognition that vendors that provide business process consulting are at an advantage when implementation contracts are awarded. A growing number of vendors are examining how they should participate in front-end business consulting. Others are aggressively hiring professionals with business consulting experience and/or establishing alliances with experienced consulting firms. The Big Six and traditional consulting companies have a competitive advantage in this area.

EXHIBIT III-16

Major Vendor Issues—1991

- Increasing competition
 - Skills
 - Clients
- Full-service suppliers
 - Business change consulting
 - Systems operations
- Investment in repeatable solution
 - Risk reduction
 - Productivity
- Consolidations and alliances

An additional vendor issue is the need and advisability of investing in repeatable solutions. These products can become the framework for customized SI solutions, result in improved professional productivity, and reduce risk of failure. Some vendors are investing in frameworks and architectures, whereas others prefer to work with the customer to provide a unique solution.

Consolidations and alliances remain an important vendor issue in the SI market. Many concerns are voiced as the market becomes cluttered with alliances. Successful alliances and acquisitions depend on a number of factors. These relationships need to be monitored and managed carefully, and even then they may not be successful.

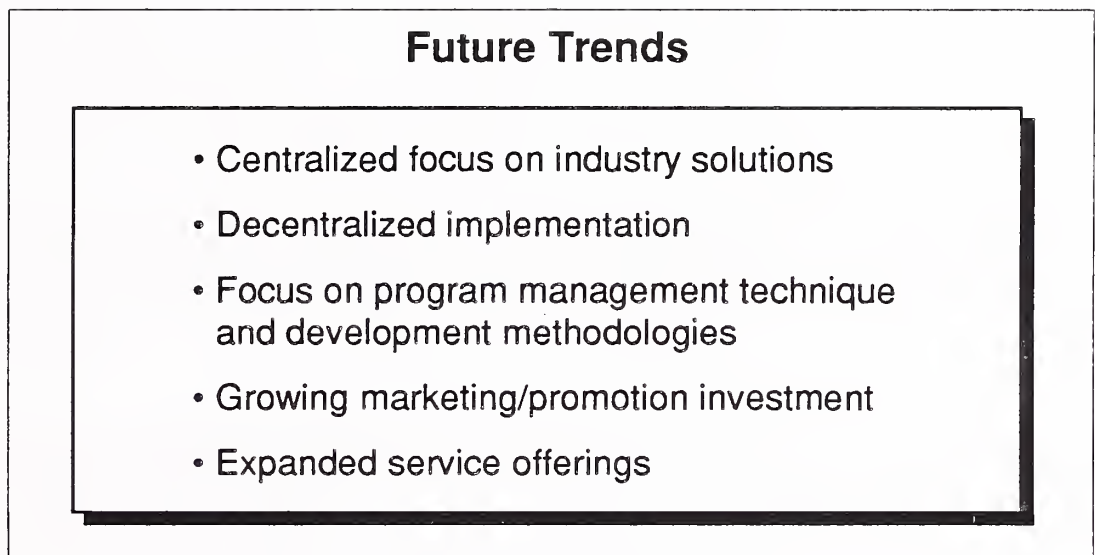
There was a significant increase in alliances in 1990, with a number of smaller hardware vendors and consulting firms establishing agreements with integrators. During 1991 this trend expanded to include networking and PC software companies.

The concern about alliances is that today's ally may become tomorrow's competitor. Once armed with the vendor's business strategies and appraisal of inside skills, the previous ally can become a very dangerous competitor. The potential for accidental exposure of pricing strategies threatens the prime contractor, partners, and suppliers.

5. Future SI Market Trends

An important element of vendor strategy development is assessing the impact of future market trends on goals, objectives, and strategies to achieve them. Though there are several trends worthy of assessment, Exhibit III-17 lists those with the most significant potential impact. Strategies to deal with these trends appear in Chapter V.

EXHIBIT III-17



The projected growth and pervasiveness of information systems integration activities in most lines of business, academia, and government have attracted the attention of a new generation of domestic and foreign competitors. Management consulting, aerospace, and defense firms are also looking to commercial SI as a needed growth opportunity.

An increasing number of vendors have established application industry centers of expertise where they have collected a critical mass of skills to focus on industry unique requirements. For example, Andersen Consulting has five separate industry demonstration centers around the country. These organizations are developing industry architectures and products that can be tailored to a specific client's needs. This trend will continue as vendors acquire not only the skills but demonstration centers to show their capabilities.

At the same time there is a trend toward moving implementation resources close to the client's site, directly under the control of the local sales arm that has responsibility for client satisfaction. The trend is to perform as much work as possible at the client site instead of the vendor's location.

Program management is clearly the key ingredient for successfully satisfying contract requirements on time and within budget. A few well-publicized "disasters" in implementing total solutions emphasize the importance of well-disciplined management techniques. Vendors will focus on this important aspect of SI and the vendors with superior systems

will be more successful. Investment in developing and improving program management techniques will provide returns in both profits and reputation. Investment in end-to-end development technologies will be equally important in improving productivity and bid win rates. CASE will play an important role in this area. One management challenge will be implementing and managing these important disciplines while decentralizing implementation.

More vendors have begun to recognize the need to promote their SI and/or SI support capabilities and successes, especially in the CSI market. The approach that gives solutions to business problems will continue to gain favor because it appeals to higher level nontechnical management.

Vendors who are not identified with the SI market are expected to develop market strategies to enter or widen their position in the market. Some will approach known competitors. Others, with unique products or services, will address prospective clients directly, hoping for a sole-source position in the contract.

Current market participants are expanding the range of services and products they offer in order to increase their share of information services revenues. Computer vendors and professional services firms offer services ranging from business consulting through systems operations. Large vendors are aggressively attempting to become full-service providers, as discussed earlier, and to capture clients for the full range of outsourcing services.

D

Competitive Environment

SI's potential for revenue growth and account control, and as a distribution channel for existing products and services, leads many vendors to claim that they are systems integrators. Few are truly integrators able to plan and manage major projects that result in successful delivery of desired solutions.

A large number of vendors participate in each of the information services industry delivery modes. SI is no exception and is rapidly becoming populated by a broad range of participants.

Casual participation by any serious vendor is very unlikely. The promise of rapid growth in the SI market attracts large and respected competitors. The combination of newness, large competitors, and intrinsic tensions between client and vendor, however, result in very demanding market conditions.

Because no firm dominates this market, the opportunity exists for vendors to create niche markets from their particular position of strength. One result will be strategic alliances among different classes of vendors.

INPUT identifies the leading competitors in 1991 by revenue, market share, and vendor class in this report subsection. Opportunities for secondary SI market vendors are also discussed.

A separate report, *Systems Integration Competitive Analysis*, provides an in-depth analysis of the competitive position, market penetration plans, industry focus, strategies, strengths, and weaknesses of the key SI vendors. INPUT also publishes in-depth SI-specific vendor profiles on the leading vendors.

1. Market Share

INPUT estimates of vendor market share in 1991 appear in Exhibits III-18, III-19, and III-20. To develop market share data, INPUT interviewed the major vendors in the market to obtain their systems integration revenues. In a few cases, vendors were unable or unwilling to provide this data, and INPUT estimated their revenues based on its knowledge of the market.

Various vendors define systems integration in many different ways. In some cases, INPUT adjusted expenditures to conform to the delivery mode definitions used consistently throughout all INPUT reports.

The revenue data provided in many cases represents double counting of end-user expenditures. For example, a prime contractor that holds the contract with the buyer will include the payments for all of the project products and services in its revenues.

Subcontractors managed by the prime contractor and providing products and services to the contract measure payments received from the prime contractor in their revenues. In many cases, multiple levels of this subcontracting occur, and the original user expenditures are further inflated by considering only vendor revenues. INPUT measures end-user expenditures when forecasting markets, as this provides a view of the total revenues available.

Of the top 10 vendors, 7 were unable to grow their revenues in excess of the market growth rate. Hughes/GM and TRW have been added to the top 10 after extensive efforts to identify SI revenue in their various divisions. Only Digital Equipment Corporation clearly increased its market share.

There are several factors causing this unusual situation. As previously mentioned, many SI programs are becoming more modularized, creating opportunities for smaller, more focused companies. It is also difficult for the larger companies to expand business segments that are in excess of \$500 million at 16% per year during recessionary times.

EXHIBIT III-18

U.S. Systems Integration Market Share, 1991

Vendor	Share (Percent)
IBM	17
Andersen Consulting(1, 2)	9
EDS/GM	8
Digital	6
CSC(2)	5
SAIC	5
Hughes/GM	5
Martin Marietta	4
Unisys	4
TRW	4

(1) Includes imputed equipment expenditures

(2) Adjusted to calendar year 1991

It must be noted that the top 10 and virtually every other SI vendor increased their SI business during 1991.

IBM has made some organizational changes to maintain its market leadership position. These changes were intended to (1) create an autonomous, equipment-independent SI focus; (2) empower program managers with industry-specific solutions to replicate them; and (3) emphasize SI at all levels of sales and marketing. Also, the IBM AS/400 has become the premier platform architecture for downsizing and client/server SI programs.

In order to conduct a comparable market share analysis, INPUT imputed a level of equipment expenditure to derive the Andersen Consulting market share. Typically, an Andersen client for an SI program would not purchase the equipment through Andersen. Most other SI vendors include the equipment in their deliverables.

As a leader in providing business process re-engineering services, Andersen has a competitive advantage in capturing any resultant SI opportunities.

TRW's and Hughes/GM's entries into the top 10 are based on a clearer understanding of their SI programs. Both of these large aerospace companies have numerous divisions performing advanced technological projects. Some of these programs are classified. Only a small portion of their computer integration efforts can be placed with the definition of information services systems integration.

Exhibit III-19 displays the ranking of the commercial SI market vendors. IBM leads with a market share of 18% and is followed by Andersen Consulting with a share of 17%. Digital has jumped to a 10% market share. Other vendors have not yet penetrated this market to the extent of having double-digit market shares.

EXHIBIT III-19

U.S. Commercial Systems Integration Market Share, 1991

Vendor	Share (Percent)
IBM	18
Andersen Consulting	17
Digital	10
EDS	7
TRW	5
Lockheed	3
McDonnell Douglas	3
CDC	3
AGS/NYNEX	3
Deloitte & Touche	2

Vendors with top 10 commercial ranking, but without extensive federal market participation, include AGS/NYNEX, Andersen Consulting, Deloitte & Touche, Digital, and McDonnell Douglas. CSC's commercial strategy that led to inclusion in the top 10 CSI vendors included acquisition of highly skilled SI firms like Computer Partners, Index Systems, and the Cleveland Consulting Group. The top 10 vendors in the federal SI market are ranked by market share in Exhibit III-20. INPUT believes that the market shares shown are high, but the ranking accurately reflects relative market positions. The revenue used to develop this ranking is

based on vendor reporting and INPUT estimates. The vendors' FSI market share is volatile because very large contracts are still being awarded.

EXHIBIT III-20

U.S. Federal Systems Integration Market Share, 1991

Vendor	Share (Percent)
IBM	16
EDS/GM	9
SAIC	8
Martin Marietta	8
CSC	7
Unisys	7
Hughes/GM	7
Boeing Computer Services	4
Planning Research Corp.	4
Grumman	3

Vendors with extensive government experience have learned to operate with smaller markups or fees than are found in the commercial market. The leading firms have developed sophisticated program management methodologies and are accustomed to the frequent oral and written reports required by government procurement regulations.

These methodologies and practices provide disciplines that are welcome in the commercial market. However, they must be applied judiciously, as they are perceived as overkill practices by some commercial organizations. The challenge for the federal vendor is to convert these practices to a form readily acceptable to commercial clients.

2. Vendor Challenges

Vendors face numerous challenges in capturing and performing successful SI programs. Some of those challenges that are highly SI specific and that were expressed to INPUT during its research are listed in Exhibit III-21.

EXHIBIT III-21

Vendor Challenges

- System integration bidding
- Program management
- Subcontractor management
- Risk containment

Following the lead of government, more SI programs involve detailed written proposals. Though the proposed technical solution is fundamental, it must be presented in a way the perspective client can understand. Today's high-impact, effective proposals are from one-third to one-half graphics. One critical area that is difficult to clearly explain concerns all of the automated tools that will be used during the SI program. These include program management, CASE, AI, and software re-engineering. Equal emphasis on financials is necessary. Most major vendors use detailed financial models to bid SI programs. Proposal development teams should remember that items included in proposals often become contractual commitments.

SI program management has become a sophisticated discipline. Research for INPUT's report, *Methods for Successful Systems Integration*, indicated that it takes seven years to develop a qualified program manager and one and a half years to train an experienced one. It is equally important to have high-quality program management processes and tools and to ensure they are properly employed.

The challenge of subcontractor management starts with selection. The subcontractor must be qualified based on technical ability, financial stability, and resources. The relationship among the prime contractor, client, and all subcontractors must be clearly defined.

Risk containment starts at the proposal phase and lasts for the entire life of the program. The most sophisticated vendors use risk analysis modeling techniques. Most vendors try to identify critical factors to success and control them. Early identification and effective correction of problems is essential. Vendors must realistically assess their capabilities and decline engagements that have excessive risk.

3. Vendor Market Classification

It is also useful to segment vendors by the classification of their core business in order to understand their motivations, strategies, strengths, and weaknesses. Core business class also provides clues that will assist in

identifying potential teammates, as well as in understanding competitors' bidding strategies. Exhibit III-22 provides this basic segmentation and gives examples of companies in each segment.

Most vendors focus their marketing on existing markets to protect and expand their existing market coverage. They look for partners, teammates, or acquisitions in skill areas, or markets where they lack market understanding or customer contacts.

EXHIBIT III-22

Systems Integration Vendor Examples by Class

Class	Examples
Hardware manufacturers	Digital, Hewlett-Packard, IBM, Motorola, NCR/AT&T, Unisys
Communications companies	AT&T, Contel, GTE, Regional Bell Operating Companies
Professional services companies	
• Consulting-based	Andersen Consulting, Booz-Allen & Hamilton, Coopers & Lybrand, Deloitte & Touche, Ernst & Young, KPMG Peat Marwick, McKinsey, Price Waterhouse
• IS professional services	American Management Systems (AMS), CAP Gemini, CSC, Computer Task Group (CTG), SAIC, SHL Systemhouse
Systems operations	EDS, Litton, Systems and Computer Technology (SCT), ISM Corporation, Systematics
Aerospace companies	Boeing Computer Services (BCS), Hughes/GM, Litton Computer Services (LCS), McDonnell Douglas, Martin Marietta, TRW
Software suppliers	Microsoft, Novell, Oracle, Sterling Software
Other	Bechtel, Covia, Deere Technology

Some vendors with extremely large customer bases—such as hardware or telecommunications vendors—view SI as a threat to account control. They seek partners or acquisitions to assist in protecting their existing business. Examples of some vendor class strategies to expand SI capabilities are identified in Exhibit III-23 and discussed below.

Equipment vendors have developed strong alliances to augment dedicated in-house staffs and to add software packages and professional services (including business consulting). These moves allow them to offer a full range of support services. IBM, Digital, and Unisys are involved in such alliances. All three vendors have also added systems operations to their offerings and are using alliances to supplement internal SO resources.

EXHIBIT III-23

Vendor Strategies to Expand Capabilities

Vendor Class	Additional Capabilities	Strategic Target
Software	Professional Services (PS)	Applications Niches
Equipment	Software/PS Systems Operations	Full Range
Communications	Software/PS	Network
Systems Operations	Professional Services	Systems Operations
Aerospace	Technology	Unique Government

Systems operations firms recognize SI as a vehicle for building systems for clients that they can later convert into long-term systems operations contracts. Most systems operations firms have added professional services skills to expand their ability to add SI to their core business.

Communications firms are adding both software and professional services to expand network services into full-scale SI projects. AT&T, Cincinnati Bell, Bell South, Bell Atlantic, NYNEX, and Ameritech have made major investments in this strategy. Aerospace firms are relying on their advanced technology capabilities to address unique government requirements. Attempts to enter the commercial markets have had mixed results.

How successful these actions will be in expanding market share is unclear. For some vendors, the addition of new capabilities and entry into new markets represent a real challenge to traditional cultures. Some vendors have already recognized that they are better served by leveraging their

internal skills and products rather than attempting to provide a large number of services and products that are not synergistic with their core businesses. So, though many of these actions may fail, most vendors recognize that they must participate in SI to protect their core information services business and customer bases.

4. Secondary SI Vendors

The principal focus of most SI market discussions is on the large programs and leading vendors. Many integrators also provide products and services to other integrators through alliances and partnerships, and to in-house integrators. One part of the market not addressed in any depth is the role and revenue potential of vendors classified as secondary suppliers. The perceptions and limitations of the secondary SI vendors are illustrated in Exhibit III-24.

EXHIBIT III-24

Secondary SI Vendors

Perceptions

- High interest level in SI—a new market
- Generally do not want to be prime contractor
- SI—a growing part of their business
- Know who major players are
- Want visibility to major players for specific capabilities

Limitations

- Experience base often limited
- No large project management experience
- Narrow technical skills
- Lack of financial resources
- If software or turnkey, restricted to own solution
- Geographically limited

Those secondary vendors showing some level of SI market involvement have a high level of interest. Most, however, do not want to assume the risks of being prime contractors. They know who the major companies are, what industries are being addressed, and some of the key clients.

The secondary vendors uniformly admit to a need for visibility of their specific capabilities to major SI vendors and users. They want to find better ways of promoting and marketing their capabilities. They would like to develop longer term relationships, to become a regular part of key vendor teams.

The smaller secondary vendors have limitations that could work to a prime vendor's advantage, lessening the prospects of working with an eventual competitor. Most of the smaller vendors have a narrow range or few technical skills and often lack financial resources to carry fixed-price jobs on the books for any length of time. The experience base relates to their particular specialty. Their software or turnkey products usually apply to their area of specialization and not to a wide range of problems or applications. Some vendors are too small to provide adequate geographical coverage.

Secondary vendors may lack large project management experience but usually commit to completing contracted tasks within budget and are motivated to be reliable suppliers. Experiences that discourage secondary vendors include assignment of a disproportionate part of the project risk and renegotiating the price of the task after the prime contract is signed.

A few major contractors in the FSI arena are notorious for their poor treatment of subcontractors. Subcontractors of all sizes need to understand all of the risks involved in the relationship. If a subcontractor is a small disadvantaged business (SDB) or an 8(a) firm, its presence on an FSI team can help win a contract.

Several of the major SI vendors have strong support vendor programs. These are aimed at maintaining good relationships through continuing communications—between projects as well as during them. The dialogue is two-way: suppliers and value-added resellers (VARs) receive training on new products/services and advice on future developments. In return, the major vendor learns about market changes, client problems, product difficulties, and supplier concerns about support, parts, and maintenance.

Information processing solution implementation becomes more attractive with each introduction of new technology. The range of potential business applications increases with each new development. New equipment and software developments offer opportunities for businesses to increase their competitiveness.

Exhibit III-25 lists the major technology drivers for the 1990s that will provide the processing power and flexibility desired by SI clients. The drivers were identified in INPUT's report, *Systems Integration Technology Trends*. Advances in program design and development, including CASE, will also play an important role in the development of information-based business solutions.

EXHIBIT III-25

SI Technology Drivers—1990s

- Relational data bases
- Networking/connectivity
- Distributed systems
- Client/server architecture
- Open systems

Relational data structures and management software permit rapid storage and retrieval of critical business information. These capabilities will allow organizations to better integrate their business activities, from order entry through manufacturing and product delivery. Open system standards will finally reduce the difficulty of tying multiple vendors' products together. They will allow clients and information service providers to apply more of their resources to solving business rather than connectivity problems. UNIX will continue to be a more important element in SI projects, particularly at the microcomputer level. It is not anticipated that UNIX will play a major role on mainframes in CSI projects in the near term.

Providing connectivity between central, distributed, and desktop systems is growing in importance. Although significant strides have been made in establishing connectivity between LANs in reasonable proximity—and some organizations have established extensive LAN-based connectivity—many organizations are struggling with how to establish true enterprise-wide connectivity. Enterprise connectivity is necessary to leverage data resources and provide timely communications.

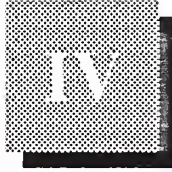
Distributed systems are defined differently by different organizations. To some, systems are distributed when data bases are moved from large mainframes to midrange systems. To others, systems are not distributed until data bases and applications are moved to desktop systems. By whatever definition, organizations in nearly all industries are developing plans to place greater processing capability directly in the hands of end users.

Client/server architecture is in high demand, but it is somewhat of an enigma to many organizations. It is uncertain exactly what client/server architecture means. Organizations are developing plans to implement the architecture, but recognize increasingly that an effective client/server architecture must be developed in concert with strategies for both data base systems and an enterprise-wide network. Most SI engagements now involve some form of downsizing, client/server, or networked architecture.

Open systems, which permit any-to-any connectivity, are a highly desirable objective. With the wide variety of specialized systems available, open systems are necessary to establish true, enterprise connectivity. However, most organizations have been able to satisfy their immediate networking requirements and are satisfied to wait for open system standards to evolve before they make major investments.

Whereas there are many questions about the best approach to integrating the leading technologies, all organizations recognize the need for integrated processing environments. All are progressing in this direction (some faster than others), and many need assistance in determining exactly how to integrate the technologies with the business processes.

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Vertical Industry Markets for Systems Integration

As previously noted, vendors may address systems integration opportunities within particular cross-industry segments, vertical industry markets, or both. This chapter discusses the characteristics and key issues of each vertical industry and the potential for systems integration projects.

Numerous factors influence the level of systems integration activities in an industry. As might be expected, they are a mix of internal and external activities.

It is equally important to note that internal factors can frequently be influenced by an integrator. Creative marketing strategies can turn a negative influence into a positive one.

The following provides a summary of key factors that influence the SI market within a vertical market:

- Competitive pressures
- Industry regulations
- Investment capital availability
- Internal technological sophistication
- Vendors' technological sophistication
- Extent of automation penetration
- System/network integration
- Centralization/decentralization decision process
- Age of systems
- End-user application growth
- User involvement in systems development process

The two fundamental measures of any market are market attractiveness and competitive position. The primary determinants of market attractiveness are size and growth rate. The market must be large enough to justify the effort, and higher growth rates mean more new opportunities. The primary determination of competitive position is market share.

For vendors entering a vertical market, consideration should also be given to the following:

- The level of expertise necessary to penetrate a particular vertical market should be present.
- Technologies and approaches to using technology should contribute to a company's competitive positioning within an industry.
- Sophistication and density of competition should be carefully investigated and evaluated. Determine competitive advantage before entering the market.
- Bidding projects with uncontrollable risks, or bidding without the advantage of key alliances essential to the desired solution should be avoided if necessary capabilities are not currently resident in the bidder's organization.

A

Banking and Finance Services Industry

This sector covers four major areas: commercial banks, thrifts, security and commodity brokerages, and other financial services. Other financial services encompass credit unions, mortgage banks, cooperatives, and personal and industrial financial institutions. Insurance is discussed as a separate vertical sector.

1. Industry Forces

Major changes in the current financial environment created trends that affect the industry's image and methods of doing business. These changes include deregulation, the thrift crisis, "rolling recession" in real estate, Third World debt, global competition, and junk bond debt.

The drastic decline of the value of all real estate is one of the greatest factors affecting most U.S. banks. In 1990, commercial banks increased reserves and restricted lending in fear of bad real estate loans. Money centers felt the effects of bad real estate loans and loans made to less-developed countries (LDC).

During 1990 and 1991 the Resolution Trust Corporation, an agency of the federal government, managed the bailout of insolvent savings and loan institutions (S&Ls). S&L investments in junk bonds and real estate, which are guaranteed against loss to depositors by federal depositors' insurance, now imperil an estimated 600 to 800 of the remaining 2,500 S&Ls. Over 700 S&Ls have already been liquidated. Current estimates of the cost are now over \$500 billion. Continuing recessionary impacts could

cause this number to grow as real estate investments continue to lose value.

The principal industry trends include extension of functions into multiple business lines, acquisitions and mergers, and new offerings of individual products and services. The industry goal is full-relationship-based banking with brokerage services, investment advice, money markets, and other nontraditional services available to the customer. These services directly affect the structure and function of information processing.

Among the impacts on the financial services sector is an apparent interest in returning to basic values in full-relationship banking—for example, a growing interest in branch office automation. Following years of developing sophisticated (centralized) systems, many banks are focusing on returning to community (branch office) banking. This return to community banking has a number of impacts on information systems.

2. Impact on Information Systems and Services

Consolidation has continued in the banking industry, motivated by declining profitability of commercial banks and the crisis in the savings and loan industry.

Consolidations and the demand for a wider range of services put enormous stress on in-house IS staff. Highly specialized experience, which may not be available in small institutions, is needed for short periods. The average life cycle of systems is becoming shorter, so more frequent upgrade or replacement is essential.

Financial managers need more information and supporting analyses to make the decisions that will keep their firms competitive. Portfolio and credit services require customer services and account managers to interact with the previously independent departments of financial institutions.

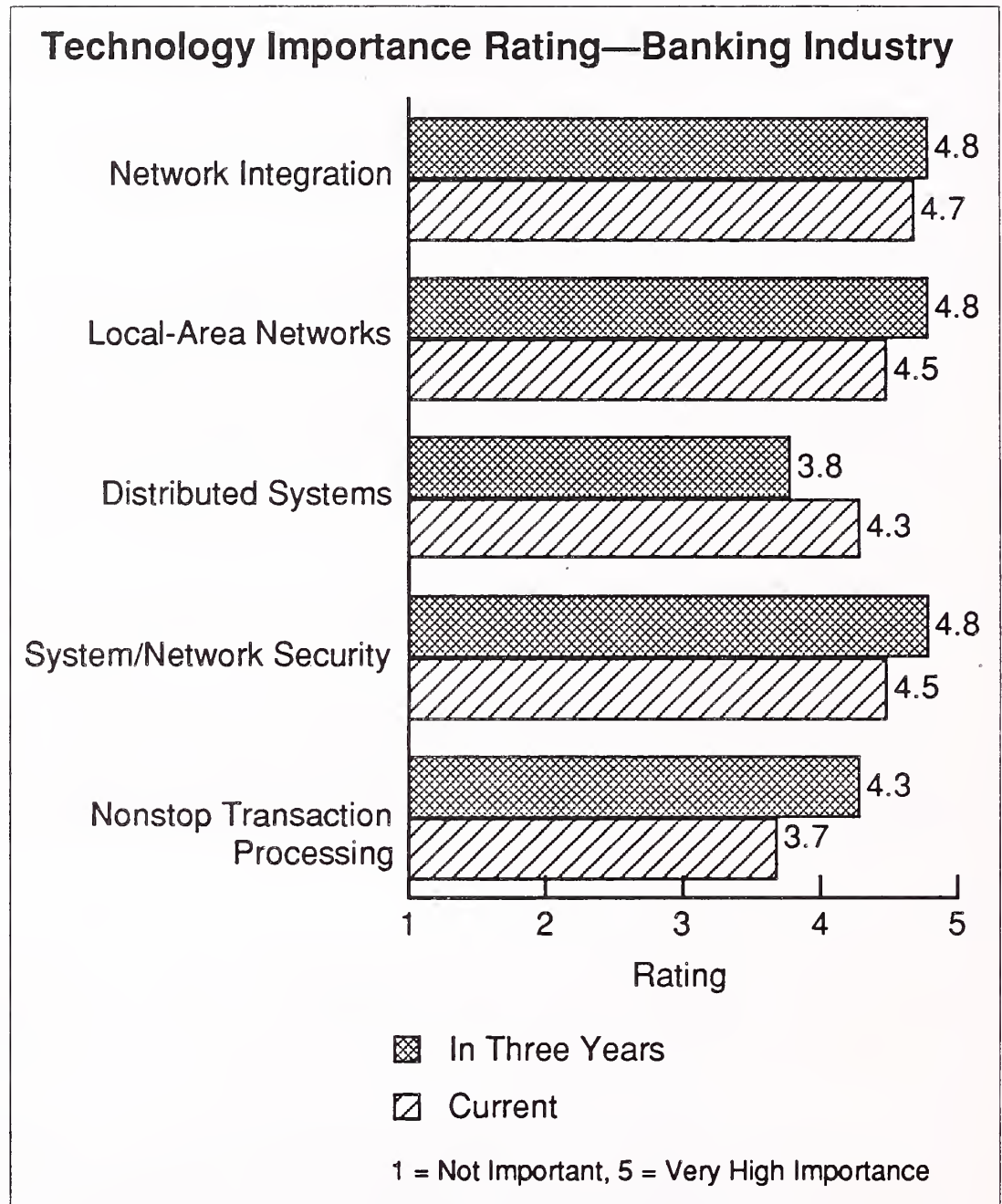
Distributed data processing needs integration with central data processing applications, employing standardized network protocols and systems architecture. New systems must provide PC-user interfaces for access to central computer facilities to allow combining of office tasks, financial processing, and service analyses by a single manager.

Expansion of access to a widening range of internal data by users and customers increases the demand for data management. Control, integrity, and security of sensitive data are major concerns of banking and financial management.

Evidence of the banking industry's need for integrated systems to support decision-making processes can be found in data from INPUT's report, *Systems Integration Technology Trends*. Research for the report included an evaluation of 14 technologies or approaches to using technologies.

As shown in Exhibit IV-1, the leading technologies in the banking industry are those that contribute to integration of decision-making processes.

EXHIBIT IV-1



- Comments indicated that automation of branch offices is among the leading priorities in banks. To provide full service, integrated customer files are needed along with networks to provide access. Branch office automation is among the leading reasons for high importance ratings of relational data bases (3.5 currently and 5.0 within three years), distributed systems, and network integration.
- Rapid growth of new services at banks resulted in a proliferation of standalone networks to support different applications. Branch offices

were frequently connected to different networks. Until recently, one of the largest banks had 150 different networks supporting different applications and business processes to the same geographic area.

- Supporting the growth of integrated applications and networks are local-area networks and client/server architectures.
 - Local-area networks support entire branch offices and key departments at headquarters offices.
 - Client/server architecture is growing in importance as a method to provide connectivity between local-area networks and wide-area networks connecting branch offices to bank-wide data bases.

The nature of financial applications requires large, centralized, secure data bases. Because of this, downsizing is not a feasible consideration for most applications. The client/server application architecture is widely used to distribute access to applications and data bases.

Demands for greater cost control, improved profitability, and improved customer service place strains on the information systems staff. One key result of these demands is continued use of systems integrators.

3. CSI Potential

The positive and negative external pressures on information systems and services are listed in Exhibit IV-2.

Systems that address the primary business (direct deposit and loan in banks, for example) will continue to be the most active areas of development. In addition, trust, centralized customer information, correspondent banking services, check processing, and commercial loan systems will need to be integrated with the traditional services.

Office automation and banking/finance applications may merge in banking officers' PCs, creating above-average demand for applications software, communications hardware, and integrated services. Demand continues for completing communications hardware purchases and integrating telecommunications networks of individually developed applications systems.

Communications technology with low error rates is particularly important, as financial companies extend their electronic transactions across the country and around the world. National networks of automated teller machines (ATMs) and debit cards are a competitive necessity. Other financial services that require extensive networking are expected.

Applications software packages continue to be in demand in this industry. Many software vendors have targeted banking/finance as a growth indus-

try for integrated applications. The availability of alternative products makes many firms believe that off-the-shelf solutions are the approach of choice for applications. Custom development will continue to be required for addressing the entire integrated solution.

EXHIBIT IV-2

Key Factors in Banking/Finance Industry

- Positive
 - Shift to merchant banking
 - Need for integrated systems
 - Increased new product/service introduction
 - Electronic transaction growth
- Negative
 - 24-hour financial market activity
 - Savings and loan retrenchment
 - Brokerage consolidations, layoffs
 - Industry and application experience required
 - Platform-based system preference
 - Network cost limits
 - Systems operations becoming an attractive alternative

Several factors can negatively affect the direction and speed of CSI development in this marketplace.

Retrenchment of the savings and loan industry appears to be consolidating support services in fewer organizations. The brokerage house reductions, layoffs, and consolidations will have the same effect. The new owners/survivors frequently have sophisticated systems in place. Like the majority of CSI prospects in other sectors, the in-house staffs will be the main competition, with a strong desire to "go it alone" in planning, managing, and executing large projects.

The banking/finance industry requires highly sophisticated, industry-specific knowledge for successful systems development. Vendors must be able to integrate advanced technology with industry-specific applications

knowledge. Vendors targeting the largest banking/financial services institutions also must be in a position to demonstrate internal capabilities.

The management of security is a critical issue in this industry. Validation/authentication of messages in transaction networks and prevention of network infiltration and tampering are now important aspects of systems development. The security issue also means opportunities for disaster recovery technologies, secure networks, and signature verification systems.

System operations or outsourcing is one alternative being used by financial institutions to control the cost of their information resource departments. There is a strong preference for continuing the use of incumbent hardware and software, especially when the vendor provides strong customer service. Today's management wants reliability in the information management process. New equipment and procedures represent a threat to the back room dependability. The same is true of network services. Reliability is absolutely essential, but not so essential as to be an excessive financial burden. Limits are set by the financial managers.

Because of demands for comprehensive, integrated system solutions and a complex array of demands on information systems departments, systems operations continues to be an attractive alternative. Systems operations vendors that can provide and maintain a complete suite of applications software reduce or eliminate the need for skilled and expensive development staffs, particularly for small and intermediate-sized banks. Banking and finance has become the largest market for systems operations. INPUT considers SI performed under an outsourcing contract to be part of the system operations (SO) delivery mode. The user expenditures related to those activities are not part of the SI forecast and market size but are included in SO.

The banking industry's emphasis on solution applications is apparent in ratings of interest in new technology. Image processing is one new technology in which financial institutions are interested. Using a combination of business process re-engineering and new technologies, SI vendors can offer this industry significant potential.

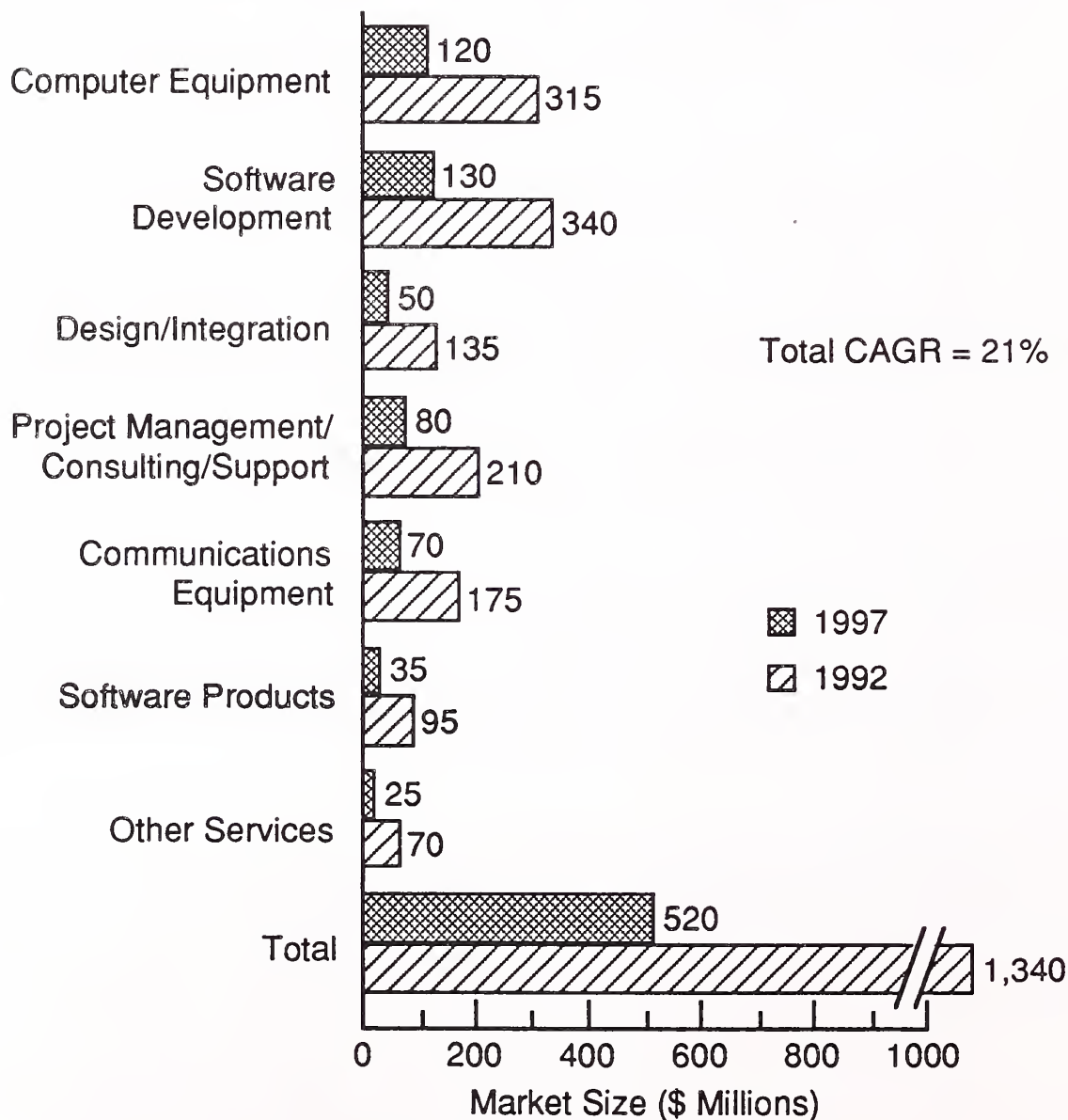
4. CSI Forecast

Exhibit IV-3 summarizes the forecast of the main components of the industry's CSI market from 1992 to 1997. Software development is the leading category of expenditures in this market segment. This reflects the difficulty in interfacing the numerous financial applications through a relational data base management system into a centralized system. The merging of insolvent S&Ls and normal merger/acquisition activity create the need to merge dissimilar data processing systems. In turn, this creates the need for SI programs with a high custom professional services (PS) content.

Design/integration and project management/consulting together account for nearly as much as software development, growing to \$350 million by 1997. Designs will be driven by the need for nonstop architecture, satisfaction of complex real-time transaction processing volumes, and rising security demands at terminal entry points. Consulting includes business process re-engineering activities. The wide range of available banking-oriented software packages will drive down the price of individual packages, offsetting increased usage. During the five-year period, the banking/finance CSI market is expected to grow to over \$1 billion in annual expenditures.

EXHIBIT IV-3

Banking/Finance Industry Forecast, 1992-1997



Data may not total due to rounding.

Over 450 information product and service vendors are identified with this market. But only a few appear as serious systems integrators. IBM has been the principal platform supplier to this industry and is now engaged in a number of SI projects with specific institutions. Other hardware vendors include NCR/AT&T, Unisys, and Plexus Computer. Andersen Consulting and Coopers & Lybrand lead the Big Six, all of whom are moving toward CSI opportunities in this market. CSC, EDS, Logica, TSC Corporation, and Systematics have become more active in the past few years, joined by management firms and software vendors like Booz-Allen & Hamilton, American Management Systems and Hogan Systems. AT&T and Telenet have been identified with several projects in network integration, and McDonnell Douglas, Bell Atlantic, Pactel, MCI, TRW, Hughes, and U.S. West are also working on SI projects.

As image processing becomes more important in this market, equipment expenditures will increase. Implementation of image processing is often contracted for as part of an SI program.

B

Discrete Manufacturing

The discrete manufacturing sector includes a wide variety of fabrication or assembly-type activities. Care must be taken not to view the sector forecasts as referring to a homogeneous market.

Discrete manufacturing is the largest sector of the commercial systems integration market, but it is a disparate collection of narrowly focused vertical markets, each with its own specific characteristics.

Analysts combine specific products into major industry groups, such as aerospace, automotive, metal fabrication, electrical, electronic, telecommunications, textiles, industrial machinery and tools, to simplify discussions of trends. Although the use of SI programs can be similar, the factors affecting each subsegment can be drastically different.

The forecast for this sector excludes unique automation devices such as robotics, material handling equipment, and other non-information machinery.

1. Industry Forces

The U.S. manufacturing industry continues to be affected by numerous factors including foreign competition and an overall weak economy. As a whole, the manufacturing industry recognizes the need to invest in new facilities and technologies that will permit more cost-effective operations. Only with significant levels of investment will the industry be able to compete against more modern, foreign producers. Investment ability is

limited, however, by weak financial structures and an increasingly limited availability of capital. Foreign competitors' successes in penetrating the U.S. domestic markets continue to discourage growth in this sector.

As a result of a weak economy and growing foreign competition, the manufacturing industry has grown slowly. Many companies have not grown at all, as evidenced by the number of consolidations and business failures.

One primary motivation to use more automation is to increase productivity and achieve cost avoidance. A major side benefit is that these same systems often do improve quality. Quality improvements also usually result in further cost reductions and productivity improvements.

The Department of Commerce's 1990 *U.S. Industrial Outlook* report projected that 80% of manufacturing companies would experience positive growth rates. However, of this total, 72% would be no greater than 5%. Only an estimated 9% of companies would grow at a rate of 5% to 10% during the year.

The Department's 1991 report indicates the situation has not improved; if anything, the situation has deteriorated. In its most recent report, 60% of manufacturing companies are expected to show positive growth rates and only 9% are expected to exceed a 5% growth rate.

Difficulties in the discrete manufacturing sector, as a whole, indicate both the opportunity for information services to improve business operations and the difficulty systems integrators have in marketing to the sector.

In INPUT's report, *Systems Integration Technology Trends*, respondents were very clear in their focus on the core business. Though a focus of the research was to identify the importance of new technologies to the industry, respondents were clearly less interested in technology than in solutions that would improve their basic operations processes.

Manufacturers have enthusiastically embraced electronic commerce. Electronic documents are used with a wide variety of trading partners. After these systems are fully integrated with existing systems, companies can also use some electronic documents to transfer information internally. Full use of electronic commerce implies an integrated desktop and shop floor system.

Manufacturers are implementing flexible manufacturing systems to improve the return on investment (ROI) of capital machinery and to provide rapid reconfiguration to meet changing fabrication/assembly demands.

Manufacturing planning and control systems (MPCS) and material resource planning (MRPII) are being employed, along with practices like

“just-in-time,” to reduce the costs of carrying inventory. Automation of the shop floor and the efficient use of inventory and capacity are viewed as the main productivity goals of the industry.

Discrete manufacturers are also using SI vendors to provide solutions for the entire warehousing, shipping, and logistics function. These can be a surprisingly challenging SI engagement.

INPUT believes that the application of these technologies can contribute to cost control. Real advances in productivity will come, however, only by revising the entire manufacturing process, rather than by piecemeal automation that produces islands of automation with relatively small improvements.

Production experts have postulated the urgency of the need to implement existing technologies, as well as those now in development, for the survival of the majority of discrete manufacturers in the 1990s. As the industry leaders implement these systems, they gain competitive advantage and bring pressure on competitors.

The current recessionary forces and lack of real growth of capital investment will delay some of the capital investment decisions needed to implement these technologies and further aggravate the cost pressures in less modern manufacturing sectors.

2. Impact on Information Systems and Services

The IS environment in discrete manufacturing seems stable, perhaps even mature. Decreasing hardware costs, better price/performance ratios, and emphasis on purchasing rather than leasing equipment have all served to create a very large base of installed systems, including both hardware and software.

The push to automate manufacturing processes has also created a very large base of mostly incompatible and unconnected process control and automation equipment, ranging from materials handling, CAD/CAE, and process controllers to assembly robots and automated guidance vehicles for parts retrieval from stores.

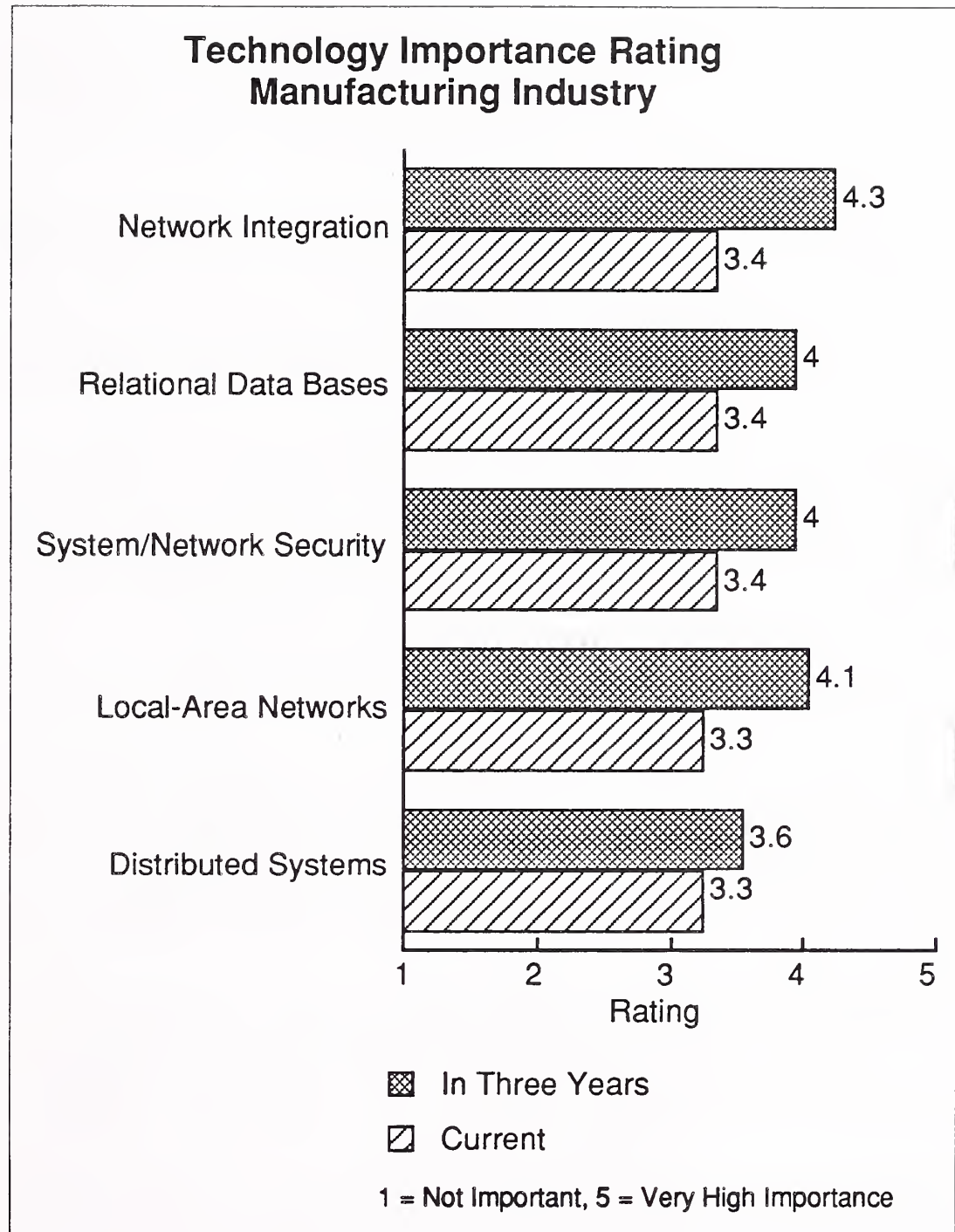
In many discrete manufacturing firms, the IS and production organizations function independently, seldom sharing the same data processing platforms. Information systems that process the financial, sales, and administrative aspects usually come under the control of the IS organization. CAD/CAE/CAM/CIM systems tend to be the responsibility of the production/operation departments, often not involving the IS department. However, the newer MRPII and MPCS technologies merge the separate functions, requiring interaction and agreement between the two groups.

The new systems that integrate the sales, purchasing, invoicing, production, and inventory control functions will push IS into interactive on-line, and real-time, or near real-time, modes of operation. A substantial number of current financial and administrative systems in this industry do not and have not needed to operate in real time, and are not equipped with hardware and software to support the needs of flexible manufacturing systems.

As evidence of the need to integrate systems and processes, consider the importance ratings of a number of technologies. Exhibit IV-4 identifies the importance of five leading technologies in the manufacturing industry today and three years from now. (Note that the rating applies to process as well as discrete manufacturing.)

As can be noted from the exhibit, a primary focus of the manufacturing industry is on technology that will contribute to integrated production processes.

EXHIBIT IV-4



3. CSI Potential

The discrete manufacturing industry has been at the forefront of CSI expenditures for some time, principally from the attention given to computer-integrated manufacturing (CIM) and manufacturing resource planning (MRP). The need to improve competitive position and availability of automated systems to improve efficiency encourages firms to adopt CSI. Exhibit IV-5 notes the key positive and negative factors for CSI in discrete manufacturing.

A key factor driving the growth of information systems in this industry is the need to integrate factory floor automation with engineering design and production planning. Use of JIT (just-in-time) procedures requires accurate measure of both demand and production rates.

EXHIBIT IV-5

Key Factors in Discrete Manufacturing Industry

- Positive
 - Integration of islands of automation
 - Increased use of data bases
 - Preference for customized solutions
 - Replacement of batch-oriented systems
 - Network distributed PCs/workstations
 - Electronic commerce
- Negative
 - IBM dominates hardware component
 - Tendency to build rather than buy
 - Industry and CSI experience prerequisite

Rapid reference to buying patterns, material supply schedules, and production capacity is increasing the use of on-line data bases. This is a new method for matching production to demand for many firms that have used human judgment in the past. The information industry lacks a comprehensive background in this area. At the same time, the uniqueness of submarkets, manufacturing processes, and scheduling creates a preference for customized solutions that could provide a competitive edge. This creates opportunities for subindustry-focused SI vendors.

The current inventory of batch-oriented systems is being replaced to meet the needs of integrating sales-to-customer factory procedures. Some of the newer hardware may be convertible, but the major share needs to be replaced. Increasing use of PCs and workstations for sales, design, scheduling, and supply/resource control will expedite the conversion, while emphasizing use of distributed networks in a difficult environment.

The variety of project types is also widespread—from the factory floor to the sales office—indicating a gradual development of traditional areas.

Application targets emphasize industry-specialized manufacturing systems, including engineering design, production/process automation, manufacturing information systems (inventory control, scheduling, material requirements planning, and manufacturing resource planning), CIM, paperless factory, and factory of the future developments.

As in other markets, IBM's hardware dominance and strategy are factors. IBM has short-term products in place (CAD/CAE, shop floor microcomputers, etc.) and an apparent long-term strategy of tying these components together in an architecture based on a data base management system (DBMS) on the mainframe. Vendors should be sensitive to the presence of IBM in determining a suitable competitive strategy.

Although IS managers frequently cite the absence of project management skills in their staffs, operations executives note the increasing use of internal systems specialists for CAD/CAE/CAM. Automation projects are built in-house as workload and financial conditions permit. The tendency of the large organizations is to build the integrated systems rather than buy them from a CSI vendor; however, more firms are looking to external vendors for CIM-related projects. Medium-sized and small companies are usually less inclined to carry the needed specialists in their constrained overhead accounts.

A critical skill for SI in discrete manufacturing is network integration. Most in-house IRM staffs are lacking in this area. The SI programs often include integrating legacy equipment and software from numerous vendors. This can be the critical factor in causing a company to decide to contract with an SI vendor.

Many IS managers in discrete manufacturing fear the loss of control that seems to be inherent in CSI and show concern for the vendor's lack of industry and CSI experience. Vendors may need to initiate early and sustained sales efforts to win major projects, and demonstrate, through alliances if needed, the prerequisite industry knowledge.

As an industry, there is high interest in solutions that increase profitability and competitive advantage. There is less interest in the technology used as part of a solution.

4. CSI Forecast

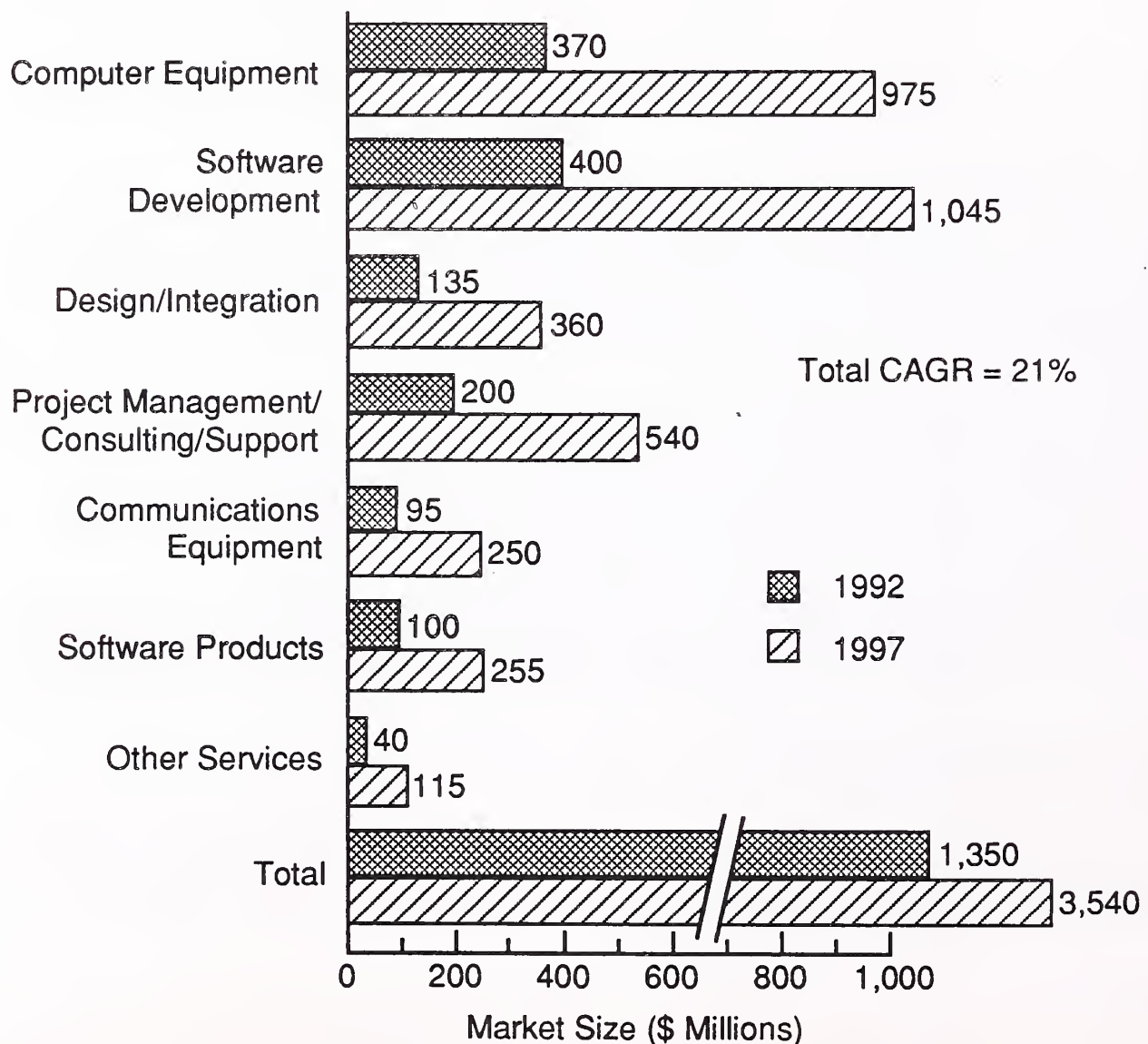
As shown in Exhibit IV-6, the discrete manufacturing sector has a CAGR of 21%, a slight decrease over the 1991 forecasted growth rate. This decrease is primarily a result of the economic slowdown and low real growth of capital expenditures.

The need to interconnect the islands of automation with sales, suppliers, and planning will increase expenditures for networks. Some parts of these must operate in demanding factory floor environments.

The different requirements of the market are being addressed by several groups of CSI vendors. The competition in hardware vendors includes IBM, Digital, Bull, Hewlett-Packard, and Litton. AT&T, MCI, and U.S. West are currently leaders in networks, whereas Harnischfeger, Brock Control, Siecor, and Keane, Inc. are leading industry specialists. In addition to Andersen Consulting, other leading systems vendors include CSC, McDonnell Douglas Systems Integration Company, SHL Systemhouse, CACI, Systems Unlimited and Computer Task Group (CTG). A number of spin-offs, like John Deere & Company's Technical Services Group, are expected to play a role where industry expertise is the most important CSI selection criterion.

EXHIBIT IV-6

Discrete Manufacturing Industry Forecast 1992-1997



Data may not total due to rounding.

This market is so diverse that even with formidable competition, it remains the single largest pool of opportunities for most systems integrators.

C

Education Industry

The education sector is subdivided into two segments—academic and industry/commercial. The academic segment comprises public and private institutions that provide basic education from kindergarten through 12th grade, vocational schooling, community colleges, and institutions of higher learning for undergraduate and graduate study.

The industry/commercial segment comprises organizations that provide private educational services such as private business and technical schools.

1. Industry Forces

Education continues to receive a great deal of attention as reports comparing test results of U.S. students to those of students in other countries show the U.S. trailing in the quality of education.

The current administration has emphasized education and is receiving strong support from industry. This emphasis should result in increased focus and spending for systems that will help improve academic achievement.

However, a number of factors constrain the use of information services within the educational market. These factors include the following:

- Flattening enrollment patterns that result from decreasing family size, and passage of the baby boom generation, although there continues to be an emphasis on post-high school education
- Constrained funding sources that result from state and local funding and spending limits
- Reduced federal spending on educational software and research grants

2. Impact on Information Systems and Services

The four major areas of opportunity for information-based solutions in education are:

- Administrative applications
- Academic/courseware applications
- Research
- Library applications

Larger educational institutions employ IS staffs to operate academic and business centers. Academic support includes timesharing mainframes and interconnected microcomputers for computer studies, campuswide networks, research, and courseware.

Administrative functions include class and teacher scheduling, student records, building and equipment maintenance, payroll, finance, and accounting functions. Library functions may be controlled by the academic department, administrative staff, or operated separately.

The increased focus on improving the quality of education should increase spending in areas that will have the most impact on academic results. This should include spending for more microcomputers and courseware in the K-12 arena and networking of capabilities within and among campuses. Microsoftware vendors continue to develop creative programs to introduce more computers in the classroom.

Industry also appears willing to spend in areas that will better prepare students in technical areas where the U.S. is trailing but that are essential for industry to be competitive. Expenditures for systems to improve computer science skills and to perform research in the advanced applications areas such as artificial intelligence, groupware, and CIM should be anticipated. Historically, equipment vendors have given substantial discounts to educational institutions. The business reasons for this do not necessarily transfer to SI programs.

Large private colleges and state university systems will be competing for public and private grants to perform research for the government and industrial companies. Competition will encourage institutions to develop and maintain state-of-the-art research facilities. Most institutions are placing heavy emphasis on the advanced research sections of their curriculum.

3. CSI Potential

Education is one of the smallest markets for systems integration, yet it includes some relatively large areas of opportunity. Factors driving these areas and hindering others are included in Exhibit IV-7.

Most colleges and universities have incorporated microcomputers as important elements in their curricula. On some campuses students are required to have a PC and on others a PC must be readily accessible.

There is a need to have inter- and intracampus networks tying together student terminals and a variety of computer resources. Only a few institutions, estimated at around 15% of 2,200, provide campuswide networks. Less than 20 state-level college and university systems have completed statewide intercampus networks.

EXHIBIT IV-7

Key Factors in Education Industry

- Positive
 - Increased demand for campuswide services
 - Network requirements/distributed computing
 - Industry-sponsored research
- Negative
 - Constrained state and local funding
 - Cuts in federal aid program
 - Political marketing environment

However, an increasing number of states are implementing statewide integrated networks. State educational institutions, primarily colleges and universities, have expressed interest in utilizing statewide networks to link campuses as an alternative to building their own networks. Many universities also use government networks like Internet and NSFNET to access other computer facilities.

In support of the presidential emphasis on education and in support of its own concerns about competitiveness, industry has increased grants to education. Many research grants have requirements for significant amounts of computer processing capability. Frequently, research is performed across several campuses.

Grants are frequently a driver in the demand for systems integration skills to build supercomputer complexes and network them throughout the research community. Although this is a positive factor, the near-term potential is diminished by current economic conditions.

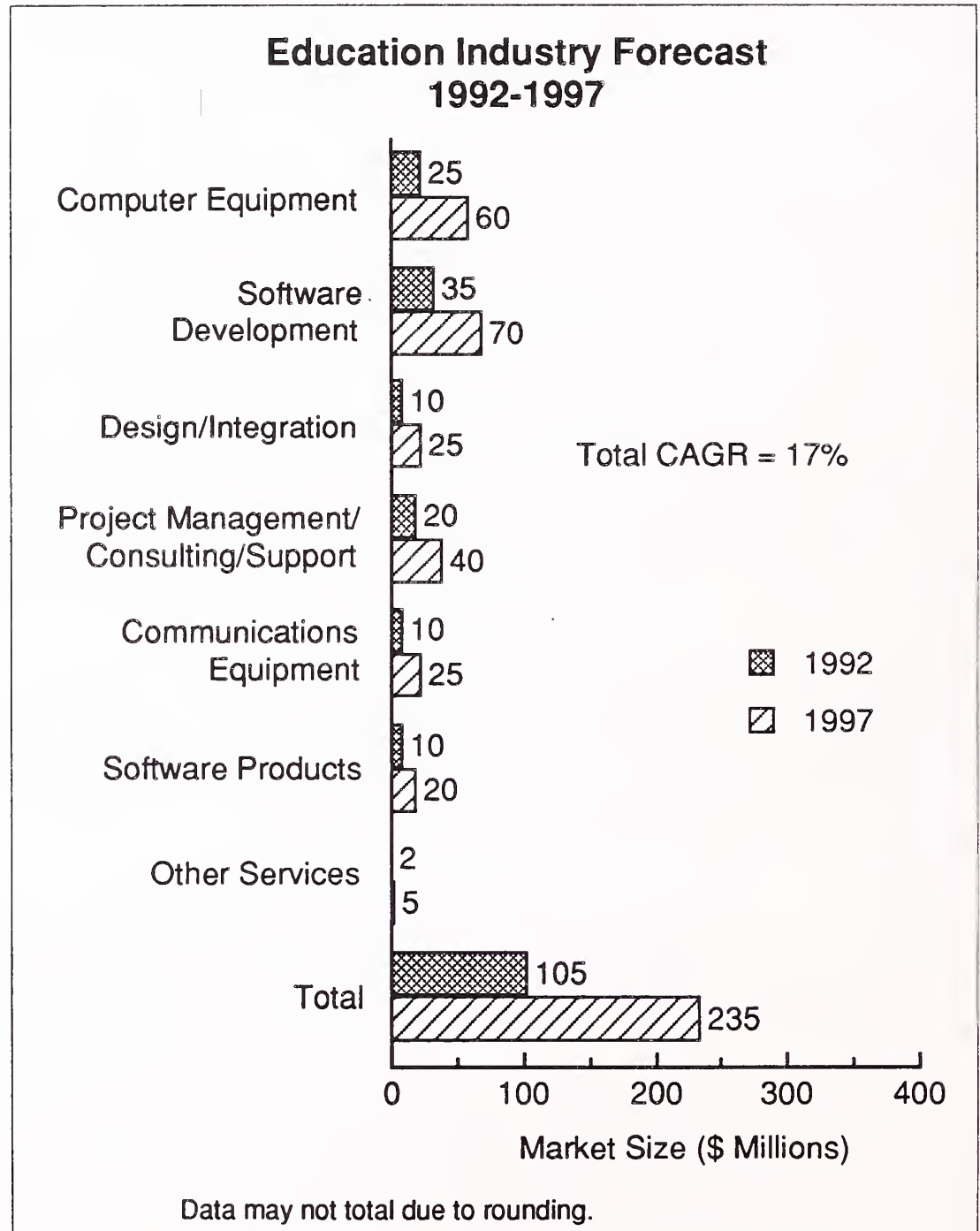
The higher education market is particularly challenging for SI vendors. The computer science department is an internal source of very inexpensive software developers. Although limited budgets are a real concern, most institutions also believe that they should do their own systems integration. This is not necessarily a business decision but rather an academic one.

The educational SI market continues to be constrained by budget limitations and political factions that want to eliminate tax increases. There have been—and most likely will continue to be—reductions in federal research grants. The political environment in education takes a special type of marketing by salespeople who know and understand this unique market.

4. CSI Forecast

The forecast for CSI education expenditure is shown in Exhibit IV-8. The market will be \$105 million in 1992 and is forecasted to grow to \$235 million in 1997 at a compound annual growth of 17% over the forecast period.

EXHIBIT IV-8



The major integration vendors in the education industry market include IBM, CSC, Booz-Allen & Hamilton, Coopers & Lybrand, Systems and Computer Technology, AT&T, and Boeing Computer Services.

D**Insurance Industry**

This sector is composed of life, property, casualty, and health insurance; the re-insurance segment of agents and brokers; and health services claims processing.

1. Industry Forces

The insurance industry is highly competitive. In addition to competition from traditional providers, many are facing further dilution of market shares by the potential entry of banks, hospitals, and foreign competitors.

Foreign competition is generally associated with industries other than insurance. On the plus side, U.S. insurance companies have an estimated 28,000 affiliates abroad, through which they sell insurance. On the minus side, approximately one-third of premiums in this country are paid to foreign-owned companies. While the overall trade impact continues to be fairly small, the data suggests that insurance is becoming as much a global activity as manufacturing or banking.

Financial institutions have made their appearance as competitors in the insurance market by offering benefit consultants, financial planners, and full-service business planners. Response to this influx of financial institutions has led to new insurance products with more complex premium calculations and to diversification into financial areas and interest-sensitive products. Individual states can separately legislate the relationship between banking and insurance.

Other problems facing the industry include increased liabilities from court actions, a growing elderly population with increasing dollar outpayment levels, the AIDS epidemic, some bad investments in junk bonds and commercial real estate, high earthquake and hurricane losses, and consumers' concerns about insurance availability and coverage. Possible opportunities for the industry include the opening of markets in Eastern Europe, Japan, and the rest of the Pacific Rim. Some of the industry problems have justly been blamed on the poor economy. Another major issue is the lack of improvement in productivity. For the last 10 years productivity has not experienced any real growth. Increased use of computer systems is one typical way to improve productivity.

Overall, the industry is relatively stable and should remain that way. Opportunity for information services vendors appears to be positive, now that more automation is required and more connectivity is needed between each agency and home office.

2. Impact on Information Systems and Services

Increased competition and lackluster performance in the investment community are causing insurance companies to reduce costs by improving efficiency. Improvement of operations and increased productivity will most likely be accomplished with a stable or reduced work force, increased capabilities of existing systems, and the automation of additional functions.

A new role for IS exists in the effective management of change, the anticipation of systems needs for new product lines, and the provision of immediate IS support. System flexibility is essential to accommodate more products, improve customer services and sales, and permit nationwide system consolidation across all lines of business. Intra- and inter-company businesses will require a level of compatibility among systems on the same order as the banking/finance industry.

Insurance companies need more timely information, especially in claims administration, to write better and more competitive policies. Access to mainframe data through enhanced communications capabilities improves user efficiency, offsetting some of the staff reductions.

Insurers have some of the nation's largest installed base of large mainframe computers. This decade will offer insurers an environment of continually improving price/performance capabilities to off-load functions from mainframes to networked PCs and workstations. This will challenge the internal systems organizations to plan and implement a major transition in their systems architectures. Another challenge is that the existing systems are large dissimilar data bases, which were not designed to work together or provide distributed access.

One bright spot in insurance company innovation is the use of expert system software technology. Artificial intelligence (AI) and expert systems play an increasingly important role in applications such as underwriting, risk management, investment planning, policy customization, and health services review analysis. Insurers are also using CASE and other software development technologies. With a mix of old systems to be renovated and new generations of systems, CASE offers insurers an ideal vehicle to cut systems development and maintenance costs and time.

Requirements exist for building an infrastructure to support agents in the field, by giving them a sales support system and for networking within and between offices.

One technology that is of growing importance to the insurance industry is electronic imaging. Faced with a never-ending flood of paperwork, insurance companies are increasingly interested in technology that will reduce the cost of managing paper records. All firms recognize the ben-

efits of electronic imaging, but they also recognize that they are constrained by a lack of cost-effective telecommunications services to connect electronic imaging systems to field offices. Image processing requires dramatic increases in computer storage, processing, and communications capability.

3. CSI Potential

The health insurance sector of this industry is experiencing growth that requires new and improved systems to support it, as shown in Exhibit IV-9. The life insurance sector has slowed and become intensely competitive. These trends are expected to continue for the near term.

Much like the banking/finance industry, insurance reacts to competitive pressure and needs to manage not only insurance products but also financial products. Recent industry changes lead insurance companies into the same arena occupied by banks and other financial institutions, causing them to offer new products that require additional computer support.

EXHIBIT IV-9

Key Factors in Insurance Industry

- Positive
 - Growth in health insurance
 - New products (insurance and financial) support
 - Need for on-line policyholder/client information
 - Global market
 - Development of new system
- Negative
 - Cost controls limit new starts
 - Continued decline in property/casualty
 - Industry-specific knowledge/experience
 - Self-sufficiency mentality

CSI projects focus primarily on integrating systems among product lines (insurance and financial, for example) and between the parent organization and the vast structure of the sales organizations (through integrated networks).

Corporate data bases might include subsystems for sales/marketing (product management, client file, agency support systems, new insurance/claims, applications, etc.), for management (accounting, accounts payable, insurance administration, office applications control system), and for policy management (loss system, rating/policy insurance, casualty rating, etc.).

Image processing has become an important new application area in this vertical market. Insurance companies are capturing complete client files on optical disk or microfilm; these files are available almost instantaneously to answer client service inquiries.

The opportunity for CSI vendors appears to be more in the development of new systems, rather than in upgrades and expansions of current ones. These new systems are important to the business, but the internal information systems department is frequently unable to develop them. Most personnel are assigned to maintenance, resulting in a shortage of capabilities in the more sophisticated technologies acquired in integrated systems. IS managers in this industry note the importance of project management skills in design and implementation of networked systems, and the frequent lack of these skills within the in-house staff.

The increased need for health insurance plus other new insurance and financial products affect the need for new integrated systems. These systems must be fully integrated to provide a complete record of a policyholder/client's entire portfolio. These new systems must support the globalization of the industry.

The most significant constraint of CSI growth is the limit placed on new system starts by the cost controls of a highly competitive industry. Projects might be performed in phases to minimize investment risks. Weakness in the property and casualty business will limit new IS systems development even more in these sectors.

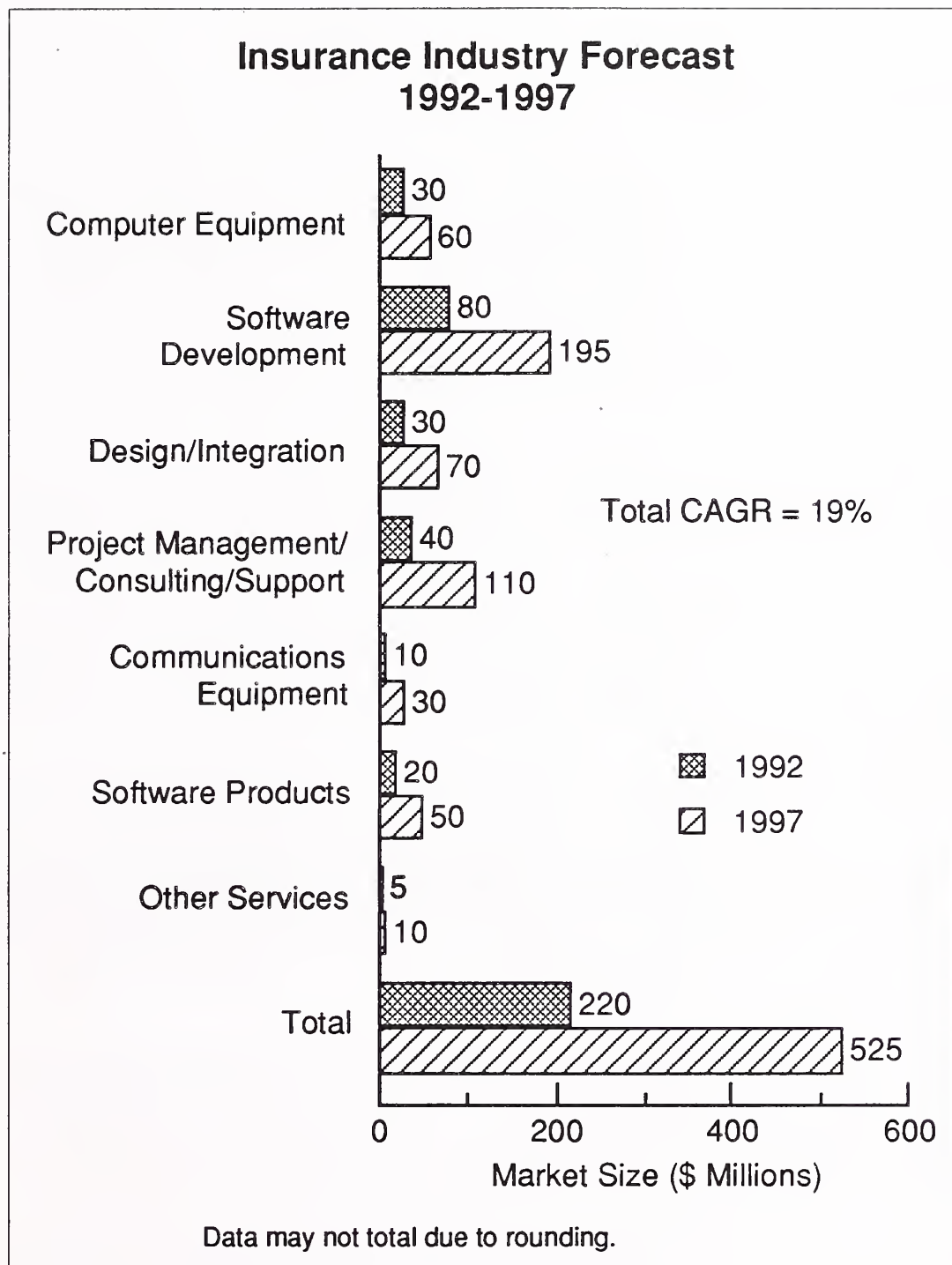
As in every vertical market, there is a strong preference for demonstrated industry-specific knowledge. This requirement tends to favor spin-offs from insurance IS organizations and CSI vendors with extensive insurance and financial systems experience. This sector had a number of CSI projects in the past that ran into major problems.

4. CSI Forecast

The forecast for this sector, noted in Exhibit IV-10, shows a 19% CAGR from a base of \$220 million in annual expenditures in 1992 to \$525 million in 1997.

The largest individual component by 1997 will be software development, at \$195 million. The customized nature of the requirement is reflected in this number and in the low forecast for standard software products and equipment.

EXHIBIT IV-10



There are only a few CSI vendors with experience in this sector. EDS, IBM, Digital, and CSC have extensive claims processing and policy systems experience. Andersen Consulting, Coopers & Lybrand, and The Continuum Corporation have implemented systems, and Equifax has provided both services and systems in specialized areas.

The predominant platform is provided by IBM, which is also providing complete systems as part of its new strategy. Digital is also having some success in this market. Plexus Computers is participating in current SI projects, as are The Continuum and Programming Resource, Inc. Penetration of this sector by CSI vendors is viewed as difficult without industry experience or an alliance with one of the established vendors.

E**Health Services Industry**

The health services industry sector includes medical practices, hospitals, medical and dental laboratories, nursing homes, outpatient care facilities, and allied services. It excludes health insurance and medical claims processing covered in the insurance industry sector.

1. Industry Forces

Health care expenditures continued to rise faster than inflation in 1991. The public is concerned about how to control the nation's growing health care costs. Competition is already a factor with the emergence of health maintenance organizations (HMOs), preferred provider organizations (PPOs), and investor-owned hospitals and group practices.

Hospital care is the dominant category of costs even in an environment where occupancy rates continue to fall. To contain costs, the length of hospital stays has been shortened by shifting to outpatient care and home health agencies (HHA).

The federal government, Blue Cross/Blue Shield and other insurance companies, and even large employers are pressuring health care providers (physicians/dentists, hospitals, laboratories, nursing homes, outpatient care facilities) to reduce costs, which continue to rise faster than the consumer price index (CPI). The rising cost of new treatment technologies, an ongoing shortage of professional nurses, and malpractice insurance cost all have an impact.

Coupled with escalating costs is a decline in the number of people with health insurance. There are an estimated 37 million people without health insurance. An additional 21 million are underinsured. Some form of service is necessary for these individuals that become ill.

With the continuing cost escalation, the federal government has taken an increasingly active role in identifying alternatives to control costs of providing health care. The government has established prospective payment systems (PPSs) in diagnostic-related groups (DRGs) and shifted reimbursements from a cost basis to a DRG basis.

With the escalating costs, a declining number of people with insurance, and the emergence of diseases such as AIDS that take an increasing toll on health care facilities, providers are forced to seek ways to provide more services at lower unit costs.

2. Impact on Information Systems and Services

Attention to the need for and cost of providing health care creates significant pressure on information systems professionals. There are a number of trends and issues that are of particular importance.

One recent trend is finding new applications for systems to serve physicians' and nurses' clinical needs—especially care planning, treatment administration, and record keeping—in ways that boost efficiency and cut costs. Cost-cutting measures are a particular need in nursing, where costs can vary substantially when overtime is required. Systems can alleviate some of the need for overtime.

On the revenue side, documentation is a closely related problem as Medicare now requires care to be documented to be reimbursed. Private payers now review and challenge charges regularly. New systems should be able to play a productive role in addressing this need. Similarly, as electronic billing/claim processing (electronic data interchange) becomes more accepted, systems will be needed to link payment and patient care systems. Electronic claim processing can cut billing-to-payment time by two-thirds and reduce error rejection ratios from 33% to under 1%. Only 20% of hospitals use EDI for order entry of supplies. To gain the full benefit of any electronic commerce system, it needs to be integrated with existing administrative systems.

There are numerous demands placed on the available capital in the industry. The industry is dominated by physicians. Investment in the latest treatment technology will always supersede investment in information systems technology.

Documented care-based reimbursements demand current, on-line handling of patient information on a cost rather than expenditure basis. Separate systems for financial operations, patient care, nursing management, and laboratory management are being integrated. Integration will reduce data entry redundancy, error rates that accompany constant re-entry of the same information, and the wasted time that occurs with both.

3. CSI Potential

Constraints in federal health care support, particularly Medicaid, will continue, and the efficiency in such diverse areas as reimbursement systems, medical records, patient history, pharmacology, and bed occupancy will fuel CSI activity, as seen in Exhibit IV-11.

EXHIBIT IV-11

Key Factors in Health Services Industry

- Positive
 - Pressure to constrain medical services costs
 - Defensive medicine requirement for more data
 - Growth in departmental systems
 - Increasing outpatient services
- Negative
 - Turnkey systems vendors very active
 - Industry experience and acceptance required
 - Limited number of large clients
 - Bottom line financial limitations
 - Crowded marketplace

Defensive medicine is practiced by physicians and hospitals to reduce the risks of unfavorable malpractice judgments. Defensive medicine includes duplicate tests, extensive diagnostic procedures, use of consultation, and extensive documentation creation and retention. The information systems associated with these activities require integration of the current standalone information and data processing systems.

Intrahospital communications networks will be important, as some networks extend to other community providers such as physicians and laboratories. Equally important will be large data bases that consolidate patient information and insurance claims tracking. Major projects will involve integrating applications within the same physical location and large departmental systems.

The pressure on facilities and rising costs of in-hospital care is moving many procedures to outpatient services. Most institutions have extended their physical plants to support the move, which is parallel to the growth of HMOs. Information support systems must be improved or developed to provide government-required records, and this growth will be reflected in a number of integration projects.

In most cases, hospital administrators feel that they have achieved almost all of the possible cost savings with current systems. To further reduce cost, hospitals will need to change some of the fundamental business

practices. In major metropolitan areas, hospitals will become more specialized. In a business processing re-engineering engagement at Lee Memorial Hospital in Ft. Myers, Florida, Andersen Consulting has helped to change the way in which health care is delivered.

Turnkey systems vendors have done well in this market and will likely continue to succeed. This is not a market into which entry is particularly easy, but local VARs have been effective in gaining acceptance from administrative and medical staffs. The result is a reduction in demand for medium-scale systems integration projects.

The size of the health services CSI industry is constrained by the limited number of establishments large enough to support the size of effort typical of systems integration projects. In INPUT's forecast, fewer than 300 organizations are sufficiently large, including major hospitals with over 300 beds, multiple-service clinics, and multisite HMOs and PPOs. Of those, only 25% to 30% are expected to undertake major CSI projects, either internally or externally.

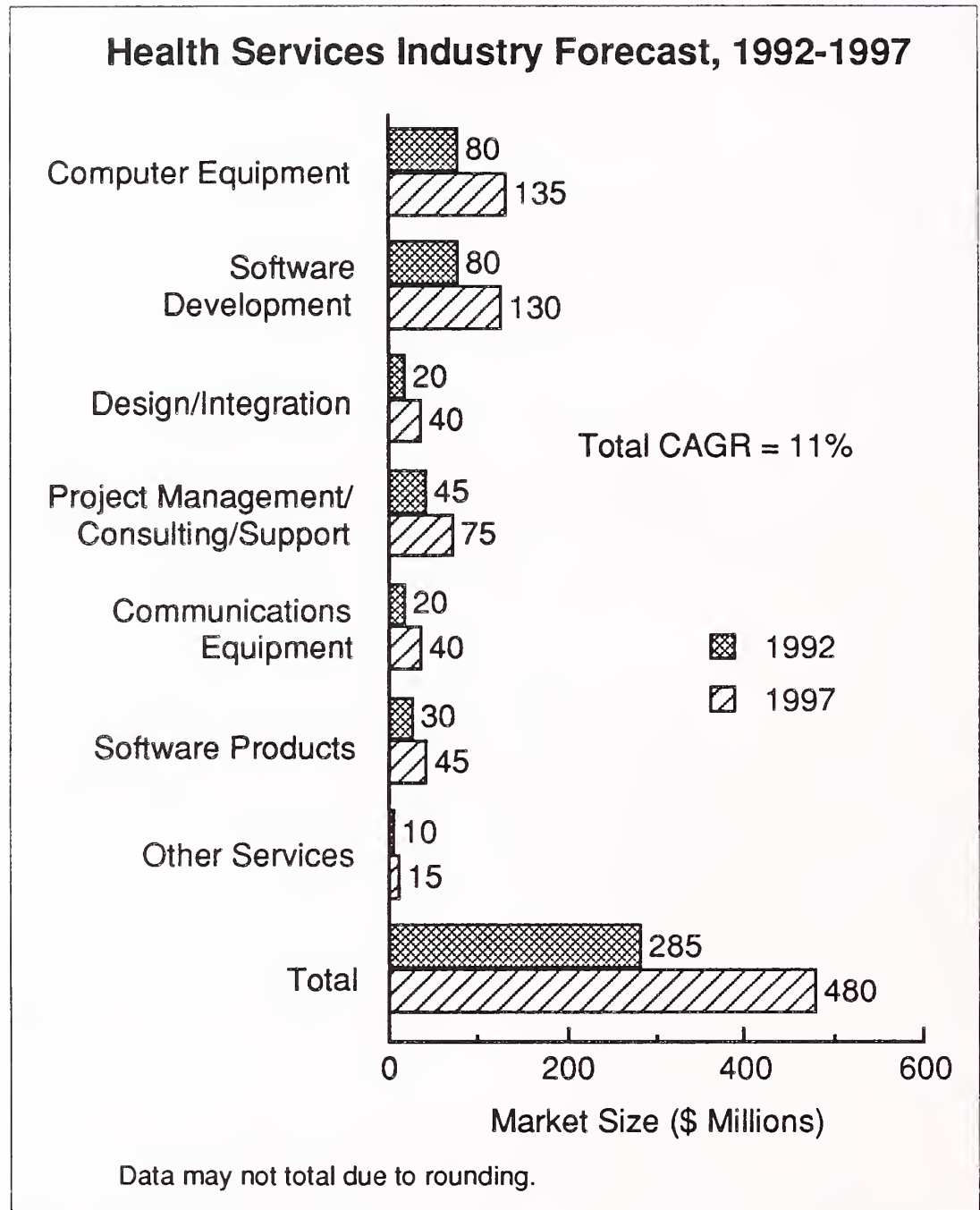
Medical institutions that have begun or recently completed CSI projects indicated that the proposed solution had to demonstrate a bottom line contribution and a cost envelope that met the institution's outlay expectations. CSI vendors need to overcome the financial limitations with creative project financing and by building a strong case for the cost savings that will result from planned projects.

4. CSI Forecast

The forecast for this sector, shown in Exhibit IV-12, identifies an annual expenditure of \$480 million by 1997 and a CAGR of 11% from a base of \$285 million in 1992. Emphasis will continue to be placed on newer computer hardware, with custom software development following closely behind. Communications prospects appear to be higher now, as new network requirements are being identified.

More than 160 vendors sell information products and services in the health services sector. Leaders in hospital IS include HBO, SMS, CSC, SAIC, and Ernst & Young. Leaders in patient care are IBM, EDS, SMS, American Express Health Systems, and CyCare. There is a relatively small number of software companies that have also successfully developed packages for the health services environment. Alliances with these vendors could be beneficial to potential CSI contractors. Current SI vendors include the companies mentioned above and Health Data Sciences, Lab Force, and Sytek.

EXHIBIT IV-12



F

Process Manufacturing Industry

This sector is a combination of medium-sized and large corporations active in oil and gas, mining, tobacco, chemicals, paper and wood products, food processing, rubber, primary metals, and plastics.

1. Industry Forces

In general, this industry sector has seen an increase in competition brought on by decreased demand from a slow economy. Wood products are suffering because of the stagnant domestic construction market. Lower

prices and margins for ethylene and plastics are resulting in increased competition for the chemicals and plastics industries. The food processing industry faces a recent trend in reduced consumer spending that may result in a shift of consumer preference to lower margin generic brands. The oil industry, on the other hand, has been marked by higher earnings, greater cash flow, and increased merger activity. However, the oil industry continues to face both near- and long-term uncertainty. Exxon, Mobil, and Texaco-Occidental reported first-quarter 1992 earnings reductions ranging from 25% to 80%.

The process manufacturing sector has been driven in recent years more by the economy and offshore competition than by manufacturing technologies. Major efforts are focused on reducing costs, improving operating efficiencies, increasing capacity utilization, and reducing capital commitment risks, while maintaining a competitive posture through automation. The solution to the cost problems of some organizations was mergers to gain economies of scale. Further mergers may occur in response to the recession that is impacting industry revenues and earnings.

2. Impact on Information Systems and Services

Mergers and consolidations in the oil and gas sector created problems of excess capacity, redundant IS staff, and incompatible processing platforms. Competitive pressure in the chemicals, food processing, and rubber and plastics industries focused attention on cost-reduction programs.

Automation of manufacturing processes, as in discrete manufacturing, has been a key initiative. Unlike discrete manufacturers, however, process manufacturers also had extensive needs for communications networks that tie the sources of raw material to the processor and the processor to the seller.

Much of the attention of information systems organizations in these industries is directed at process control, inventory control, and manufacturing control systems. These systems are traditionally the domain of the minicomputer vendors and the specialty instrumentation suppliers and are less amenable to processing on general-purpose machines. All of these systems, however, do generate data streams for general business procedures such as scheduling, purchasing, and inventory control.

Often the shop floor process control system and the general business system are developed by different departments without any consideration given to sharing data. The merging of these disparate systems is often the major challenge for the SI vendor.

This sector continues to offer opportunities for process control, inventory control, and shipping control systems with heavy engineering and instrumentation content. Processes to be automated tend to be simple in overall

concept, but complex in implementation detail. Quality and environmental control-and-inspection systems with associated materials handling are focal points for systems integration projects.

Automation integration efforts to date were almost entirely focused on production. Information systems and software projects concentrated on MRP/MRP II, accounting, inventory control, and statistics applications, with little integration involved.

3. CSI Potential

Unlike discrete manufacturing, process manufacturing firms are much slower to adopt CSI. Expenditures in 1992 are estimated to be \$360 million and growing at a somewhat slower rate of 14%. The smaller number of firms and fewer major project starts set these two industries apart. INPUT has made a substantial upward revision of the 1991 market size. Although there are still relatively few opportunities in the shop floor control systems, there are more SI programs involving the business and logistics systems. Exhibit IV-13 shows the key factors in CSI in process manufacturing.

EXHIBIT IV-13

Key Factors in Process Manufacturing Industry

- Positive
 - Competitive need to meet market demands
 - Need to improve operating efficiencies
 - Network design/integration requirements
 - Need for support for marketing and strategic planning
 - Need for customized solutions
- Negative
 - Few large enterprises
 - Decline in economy
 - Process concentrated in operations

Like discrete manufacturing, the process manufacturing has a competitive need to meet widely varying market demands. Participants need to unify and coordinate diverse data structures, process systems, and application developments to support marketing and strategic management. A number of recent projects focused on network design and integration to aid in the unification process; these activities will expand to multiplant operations.

In-house information systems departments and senior corporate management are increasingly looking to professional services and system integration vendors to provide strategic planning consulting, implementation strategies, business process re-engineering, and integrated solutions. Because of the large size and unique applications, there is a strong desire to perform much of the application development in-house.

A major competitive tool for exploiting the potential of this captive market is for a vendor to be able to provide cost-effective custom solutions. To do this requires strong capabilities in development processes and tools such as CASE, 4GL/RDBMS, and AI. Andersen Consulting and other Big Six companies, CTG, EDS, and MRPII-oriented components of companies, like Dun and Bradstreet and TSC, have been capitalizing on just such capabilities.

The improvement of operating efficiencies will concentrate on automation, MRP/MRPPII, and production control systems that can provide higher capacity utilization with lower operating costs. These improvements are expected to contribute to reduction of capital investment risks.

Business and administrative systems integration programs have been performed by IBM, CSC, and SHL Systemhouse. Digital has more emphasis on process control and CIM applications.

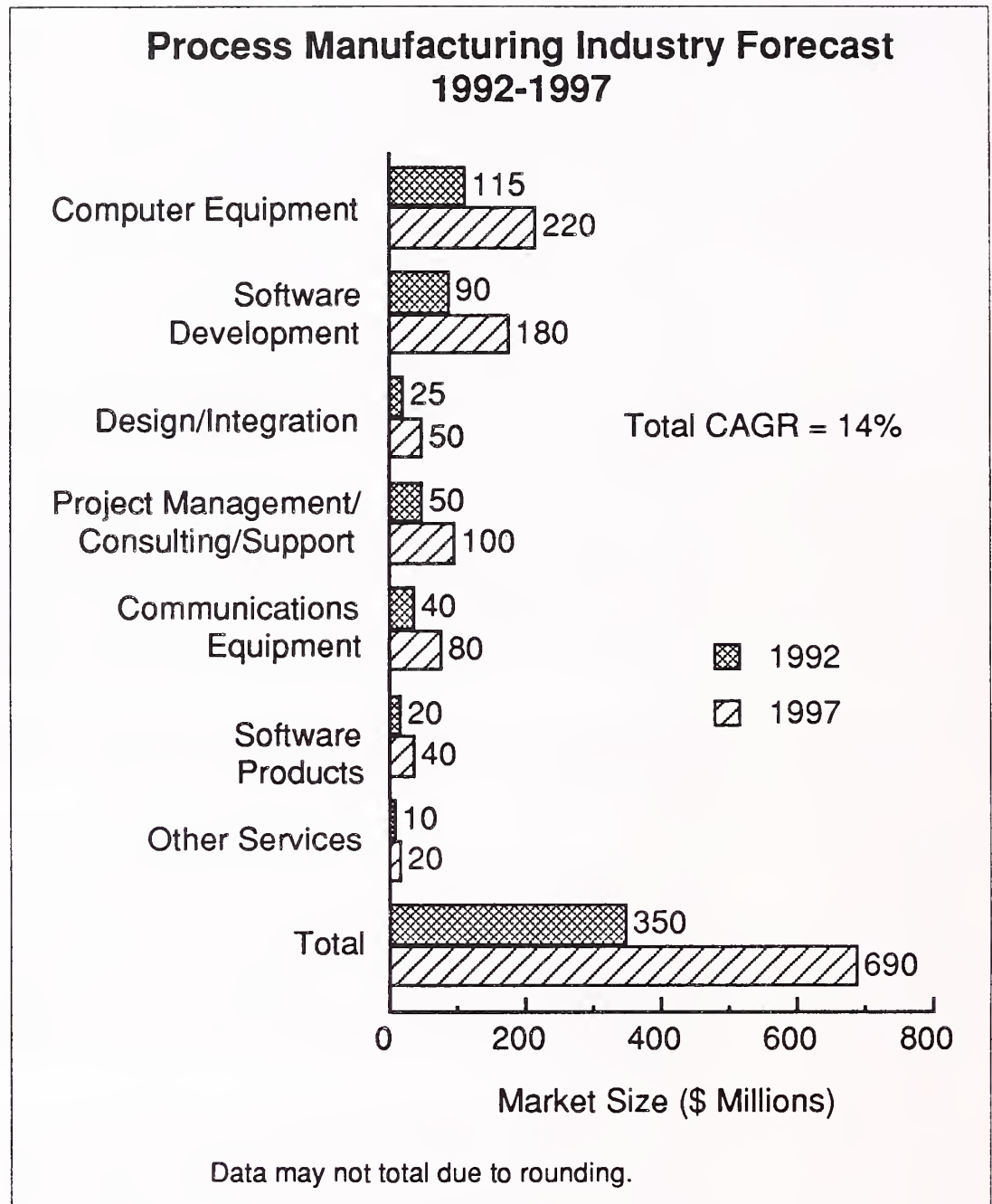
Training and transition management is highly valued in projects, but internal staffs appear to be inadequately prepared to provide it. In this market, support for marketing and strategic planning requires more sophisticated tools that are well suited to computer use, and that will add to CSI prospects. Each industry—and even specific companies—employs processes that will need customized solutions from vendors with industry knowledge.

From a negative CSI perspective, there are a limited number of large enterprises capable of supporting significant integration projects. During the last decade, the number of firms has dropped, but revenues have improved. The decline in the economy provides a warning of lower profits and an opportunity, if seen, to initiate automation projects for more economical operations. In this industry, the projects are concentrated on the operations side, which must be the focus of potential CSI vendors.

4. CSI Forecast

The 1992 expenditures in this sector, as shown in Exhibit IV-14, are 27% of the expenditures in the discrete manufacturing sector. By 1997, yearly CSI expenditures are expected to reach \$690 million. Computer hardware edges out software development as the most important component.

EXHIBIT IV-14



The professional services components of project management, design, and integration expenditures appear small in relation to software development in most of the other vertical markets because operations organizations employ more technical staff, and the ratio of information systems to production systems is smaller. The other services category includes instrumentation and process control specialists needed in CSI projects to meet technical criteria.

There are no principal competitors, but a number of potential partners for CSI exist in the group of heavy machinery and automation vendors in each vertical segment.

CSI contracts in this sector are in evidence—for example, Andersen Consulting for food products—but are generally few and small in size.

Most the of the vendors in the discrete manufacturing sector also win contracts in this industry. Among them are Andersen Consulting, CACI, CSC, Digital, and Harnischfeger. Other vendors include Coopers & Lybrand, CDC, Deloitte & Touche, Bull, Ernst & Young, McDonnell Douglas Systems Integration Company, EDS, and SHL Systemhouse.

G

Retail Distribution

The retail distribution sector includes single establishments and chains in apparel, food, appliances, drugs, hardware, etc.

1. Industry Forces

Fears concerning a slowing economy and other gloomy economic outlooks are causing consumers to cut back spending. The "real" unemployment rate is estimated at over 10%. Seasonally adjusted, retail sales have continued to drop and are expected to rebound slightly as the economic downturn begins to bottom out. Increased competition and a battle for market share could be the consequences. Generally, there is an excessive amount of floor space devoted to retailing, twice as much per capita than in 1974. This oversupply can only lead to destructive competition, failures, and consolidation in the industry.

There are only 800 large retailers among the more than one million retail companies that are the principal targets for CSI in the immediate future. The emphasis of these companies will be on improving and integrating external and internal communications.

Externally, communications with customers is very important. Better communication links facilitate the flow between customers, outlets, retailers, and wholesalers. The use of information systems for credit checking and point-of-sale (POS) data collection ensures the steady flow of funds while monitoring inventory. Back-office use of computer-to-computer order processing increases the speed of locating and delivering merchandise.

Internally, the primary use of automation is applications for closely monitoring finances, supporting financial decisions, and analyzing profit margins, but not for providing strategic management decision information.

Although management is concerned with the increasing communications costs required to support broader networks, it believes that the use of technology is the only way to simultaneously control costs, track customer buying patterns, manage inventory, and match merchandise to demographic buyer interests.

2. Impact on Information Systems and Services

The mission of IS, given the broad diversity of products handled by each outlet, is to provide systems that control logistics associated with warehouse and shelf inventory, pricing and obsolescence of goods, etc., while also handling the logistics of credit check verification, bad credit losses, cash handling, and funds consolidation and transfer.

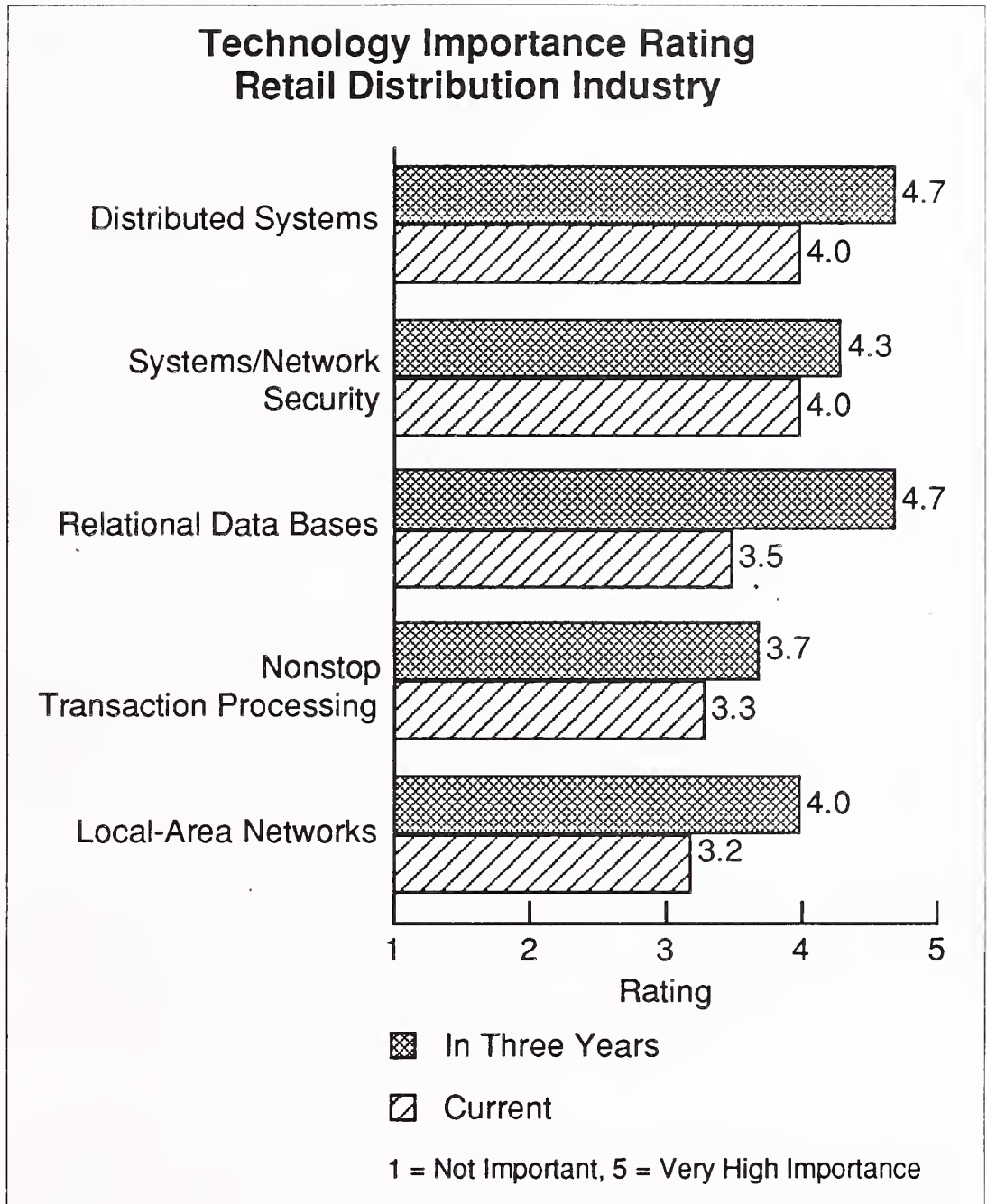
IS is also expected to develop customer-oriented services for faster and simpler order entry, transaction processing, in-store processing (distributed processing), and the use of such technologies as EDI to reduce paperwork.

Provision by IS of real-time information for improved decisions by management means improved marketing/sales data, sales demand forecasting by demographic areas, vendor performance ratings, telemarketing systems, advertising effectiveness, and inventory deployment models.

Increased integration of data processing and communications in the distribution industry is essential to provide on-line connectivity of all operating elements, distributed processing to all locations, and end-user support throughout the organization. In one example Digital is integrating NCR cash registers, DEC microVAX computers, and a Burroughs mainframe for Toys R Us.

As evidence of the need to integrate systems and processes, consider the importance ratings of a number of technologies to the retail industry. The ratings were developed as part of INPUT's research into the importance of new technologies to the systems integration market. Exhibit IV-15 identifies the importance of leading technologies in the retail distribution industry today and three years from now.

EXHIBIT IV-15



There are several points to note about the importance of technology to the retail industry.

- The retail industry is increasingly interested in placing greater intelligence close to points of sale and at major distribution centers. In addition to providing for the collection and control of greater amounts of data at points of transaction, distributed systems reduce communications costs. As systems become more distributed, the focus of corporate processing facilities shifts from transaction processing to data storage and analysis.
- Data security is a growing concern. Retail outlets have a growing interest in accessing corporate and distribution center systems to place

orders and check on the status of orders previously placed. Permitting access brings up the specter of customers obtaining company-sensitive data.

- Providing security for the increasing number of data collection and access devices that use wireless communications is a growing concern. Many people in the retail industry believe that use of wireless communications opens systems to a variety of unauthorized access.
- As with other industries, the retail distribution industry will place increased attention on the use of relational data bases. Because of the wide variety of product and pricing options, retail organizations have developed complex systems. They have been reluctant to commit to major conversion efforts—as evidenced by the current rating of slightly over average—but recognize that relational data bases will be a necessity in the future.

3. CSI Potential

The shift to financial controls and demographic merchandising requires drastic redesign of outdated pricing and distribution applications. Integration of newer technologies—including simulation, expert systems, EDI, and decision support systems—is viewed as essential to maintaining a competitive position, as seen in Exhibit IV-16.

EXHIBIT IV-16

Key Factors in Retail Distribution Industry

- Positive
 - Focus on financial controls
 - Increasing use of POS and optical technology
 - Strong interest in customer service
 - Network design and project management needed
 - Drive to higher inventory turnover
- Negative
 - Infrequent use of outside services
 - Smaller than average project expenditures
 - Prevalence of small companies
 - Low profit margins across industry

POS technology provides information that can be applied to inventory turnover, demographically-based demand, advertising effectiveness, sales efficiency, and space utilization analyses—which are rapidly replacing merchandising intuition as the basis for distribution decisions. Optical technology applications range from bar-code label readers to support POS and warehouse transactions to color-sample comparisons and broad-band data communications for more error-free capture and movement of data.

Retail establishments have rediscovered the critical importance of customer service in ensuring repeat sales. Among the tools being employed are rapid credit checks and multiple payment methods, early warehouse response to local out-of-stock requests, telemarketing services, and accurate tracking of shipments to clients. All of these depend on rapid and accurate transfer of information that may exceed current systems capabilities.

From a functional point of view, retail organizations are seeking outside help for communications network integration, voice/data integration, client/server applications, and office information systems integration. IS managers' analysis of their own in-house capabilities and constraints suggests that managers feel the current staff is not available and/or does not have the technical capabilities required for these types of projects. Specific skills required relate particularly to network design and complex project management.

Leaders in the retail industry are investing in better ways to increase inventory turnover and reduce inventory excesses. Methods include EDI for rapid transfer of orders to production sources and suppliers and, in turn, shipment to specific outlets to minimize risky interim shortages of salable goods. This provides a supply version of JIT that avoids overstocking and the risk of unsold inventories.

Small margins, low investment capital availability, increasing labor costs, and rising facility costs have discouraged frequent use of outside services, except when considered absolutely essential. Most information product or service acquisitions are piecemeal and build on existing resources.

Through the aggressive use of information technology one retailer, Wal-Mart, has virtually eliminated one level of wholesale in its distribution chain. The resulting lower cost and increased profit margins have helped to make Wal-Mart the fastest growing and most profitable retailer.

Although the number of companies in the distribution industry that could support CSI is large, major project expenditures have been limited. The large number of medium-sized firms have traditionally not been driven by the need for automated solutions as much as by merchandising skill. But this situation is changing as large wholesalers and retailers find margins shrinking even further in a more competitive environment.

Price competition is being driven by high-volume warehouse-type mega-stores. The information systems requirements of this distribution channel differ from the more service-oriented retailing operation.

Whether performed in-house or through contracts with systems integrators, INPUT believes that the retail industry will place increasing attention on the development of integrated systems.

4. CSI Forecast

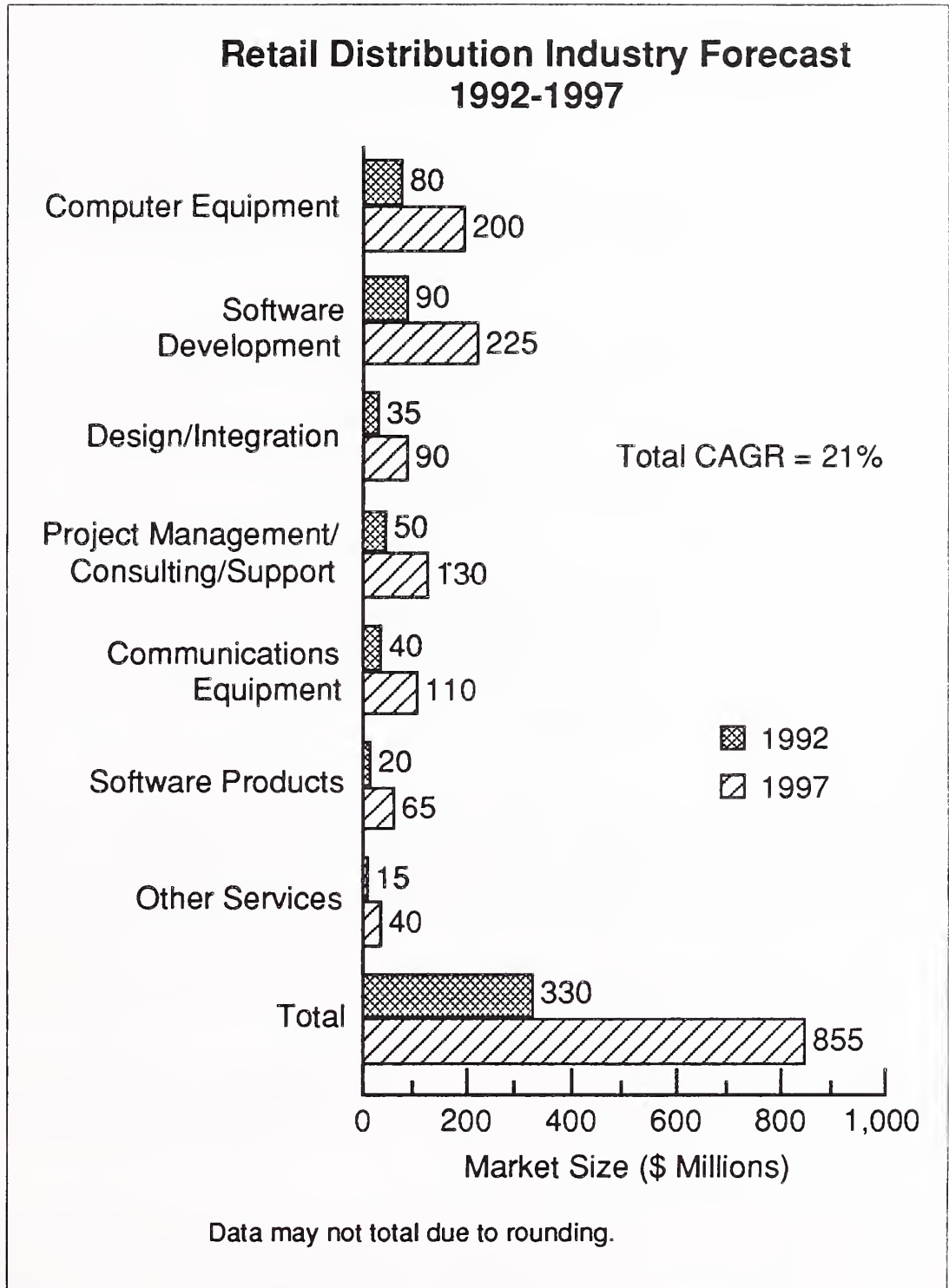
The forecast for this market, shown in Exhibit IV-17, indicates comparatively strong growth in CSI expenditures (CAGR 21%) as the use of automation as a competitive weapon is felt from the display floor to the loading dock. By 1997, retail distribution expenditures for CSI are expected to grow to \$850 million annually from a 1992 base of \$330 million.

Interconnection of a wide range of existing resources with the new systems will drive software development higher than computer equipment over the forecast period. Software products will grow in the out-years, after the initial infusion of EDI and similar communications packages. Also, consulting services fees will be greater than project management fees.

Application areas are expected to extend from sales/marketing (sales demand/budgeting/forecasting, scheduling, sales tracking, telemarketing, order/entry processing, and credit checking) to management (payroll, retail accounting, human resources, accounts receivable, purchase order systems, and warehouse control).

The use of outside CSI vendors for significant projects is not yet evident in this sector. Rather, smaller projects are being implemented by regional integrators. The largest recent awards involve network integration with GTE, Hughes, AT&T, Illinois Bell, MCI, and Southwestern Bell winning some of these awards. The principal platforms are provided by Digital, IBM, and NCR/AT&T. The most visible systems houses are CSC, TSC, and EDS; Andersen Consulting and Ernst & Young represent the Big Six.

EXHIBIT IV-17



H

State and Local Governments

This sector includes city, county, regional/district, and state government bodies, particularly those involved with public safety, highways, welfare, education, health and social services, and sanitation.

1. Industry Forces

Much like the federal government, state and local governments have come under greater financial pressures as requirements for services increase without corresponding improvements in the tax base. Vendors view the state government sector as especially promising, and in some cases, as an alternative market to the declining federal sector.

If past contracting patterns continue, 45% of state and local government expenditures will come from state government, 30% from cities, 14% from counties, and only 11% from districts and other authorities. Staff retention problems, increased demands for services, and new technology expertise are driving dependence on contractors rather than on internal personnel.

Federal programs and initiatives also have an impact on state and local governments' purchases of information technology. These purchases are usually not accounted for in state and local government budgets. The National Crime Information Center 2000 initiative, sponsored by the FBI, will allow states to purchase workstations and other equipment necessary to participate in a national automated data base system to identify, match, and analyze criminal data.

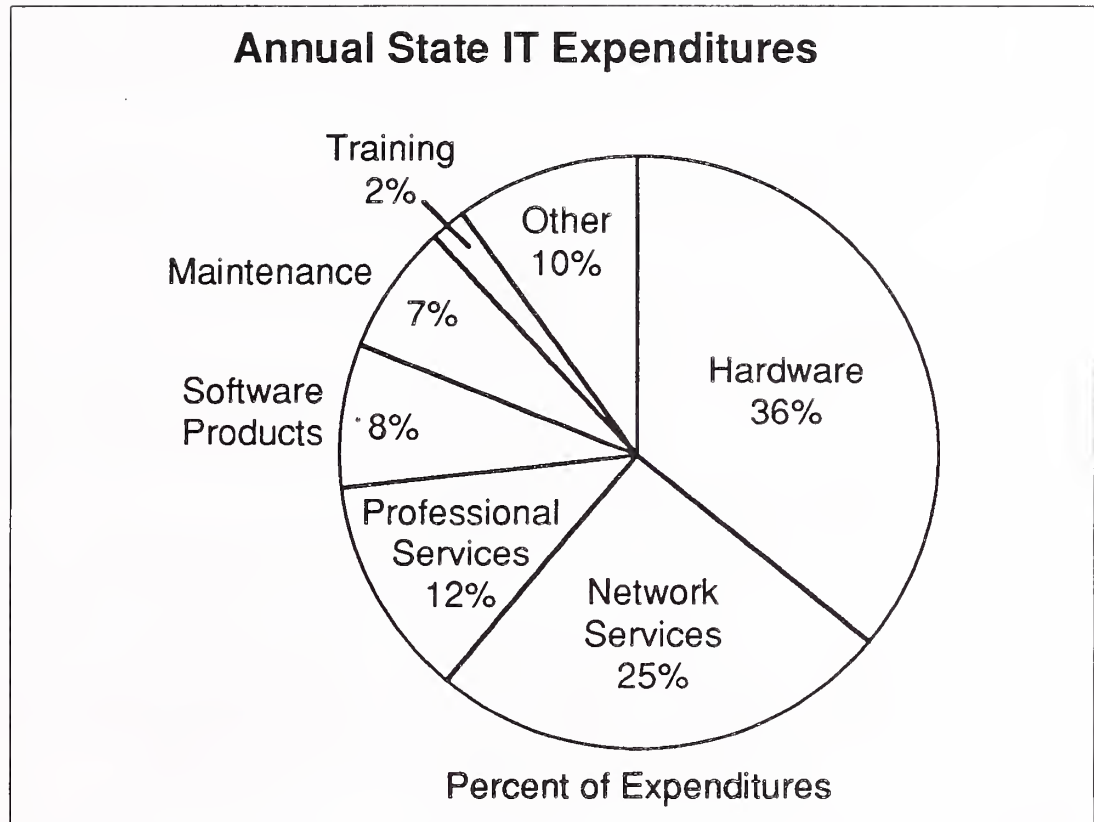
The Department of Health and Human Services is linking 52 sites nationwide through its Child Support Enforcement National Communications Network (CSENET). Case information will be standardized and shared across state boundaries.

Industry vendors hope that the Department of Transportation's (DOT's) Land Transportation Program, the Federal Highway Authority, the EPA and the Targeted Cities/Alcohol-Drug Abuse programs will offer opportunities for vendors in the state and local government market.

INPUT estimates that total information technology expenditures for state governments are at least \$4.73 billion annually. Exhibit IV-18 shows the percentage breakdown by each service/product category. From an analytical viewpoint, the term *information technology* (IT) encompasses all the categories listed in the exhibit. Information systems (IS) and services refer to computer/telecommunications-related products and services that are oriented toward the development or use of information systems. IS

excludes hardware purchases independent of associated software and services from vendors. Systems integration as a subset of IS includes bundled combinations of products and services, where the vendor assumes total responsibility for the development of a custom solution to an information systems problem.

EXHIBIT IV-18



The percentages exclude all personnel costs, real estate rentals, and purchases and supplies.

IT budgets are either growing or remaining flat. Information technology is now viewed by some governments as an investment enabling overall cost savings in performing functions and services.

One-quarter of state IT expenditures will be expended for network services requirements. State governments are increasingly networking replacement and new on-line systems. Network needs between state offices are greater in states having large geographic areas and/or populations.

2. Impact on Information Systems and Services

The mission of information systems departments in state and local governments has broadened considerably in recent years. Despite overall budget cuts and limitations, public demands for new services from governments continue to mount in the areas of health and social services; tax and fee

collection for licenses; court and criminal justice automation needs; real estate construction/inspection/assessment data; voter, vehicle and business registration; and public safety and civil aid services.

Older batch processing government information systems and many manually performed processes are being replaced by interactive on-line systems. LANs and WANs are replacing existing standalone workstations inter- and intra-agencywide. The downsizing trend from mainframe processing to microcomputers is also emerging in this market.

State and local governments are re-engineering their workflow processes. One result of this process is the growing use of multi-agency applications in the areas of revenue collection, licensing bureaus, health and welfare services, and police/courts/corrections.

Larger states, such as New York, Michigan, and Illinois, were the first to implement integrated statewide networks. However, many smaller and medium-sized facilities of counties and districts are joining the ranks of integrated information systems.

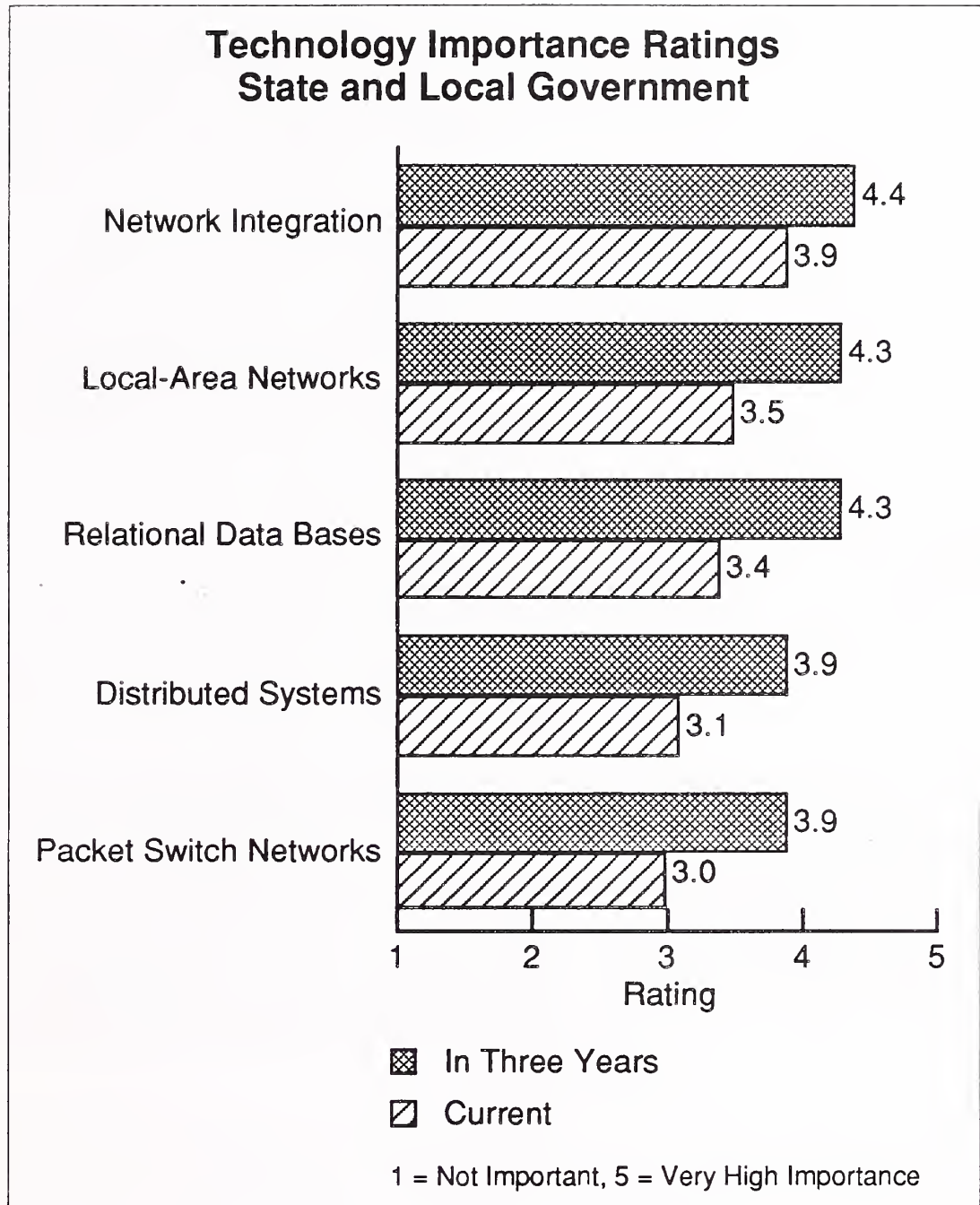
Cutbacks in in-house personnel and the inability of government agencies to remain competitive with private industry in salaries for technical personnel have resulted in a shortfall of qualified in-house staff. Requirements for expertise in new technology, such as network management, imaging, geographic information systems, and multimedia integration is further fueling opportunities for CSI vendors.

Exhibit IV-19 summarizes the importance rating of several technologies to state governments. The ratings for these technologies were obtained from research conducted in 1991 for an earlier INPUT study, *Systems Integration Technology Trends*.

State governments show the greatest interest in technologies that permit integration of applications with users. The three highest rated technologies are for data bases and networking, all oriented to providing users with greater access to data. Over the next three years, state governments will have increasing interest in technologies that provide connectivity between the wide variety of installed systems.

Current INPUT studies indicate that state and local governments are also showing interest in imaging and geographic information systems products. Image technology streamlines many paper-intensive functions and services. Police departments and vital records services are common targets for this technology.

EXHIBIT IV-19



The use of geographic information systems (GISs) is becoming more popular at state levels to track population, land use, and natural resources. Some applications of GISs include civil engineering projects to plan highway projects, and disaster recovery operations. At the municipal level, GISs are employed to track and map services.

3. CSI Potential

The need for integrated systems in the government sector is growing. The key influences in this market are shown in Exhibit IV-20. The principal customers will be found in industrial and coastal states and large metropolitan and county areas that have larger tax bases.

Automated ways for the public to access local government information and vital records and perform automotive licensing duties are fueling needs for multimedia technology. Many manual tasks can be easily automated using multimedia applications. Implementation of this technology has been slow due to a previous lack of comprehensive network support. However, this will change as second-generation PC-based network systems become more prolific in the market.

The lack of government project managers and technology experts should substantially increase CSI prospects. Executives and governing bodies are pressuring for shared data, data and computer security, reduced maintenance backlogs, and improved delivery of public services. Hardware and software tools that offer alternative solutions to public sector problems are actively sought.

EXHIBIT IV-20**Key Factors in State and Local Government Market**

- Positive
 - New technology needs
 - Continued demand for new technology
 - New program and service demands
 - Requirements for access to public information
 - Shortfall of qualified in-house staff
 - Increasing network and resource-sharing demands
- Negative
 - Dispersed market (82,000 government units)
 - Emphasis on local vendors
 - Federal revenue sharing needed

One interesting window of opportunity appears to be systems operations (SO) contracts. It is not uncommon for vendors to extend CSI projects into SO contracts on completion. Conversely, a number of CSI projects grew out of SO contracts for operating existing but older systems, particularly at the larger county government level. By the end of the project, the contractor is well known to the client and has a better understanding of the system than anyone, including the client.

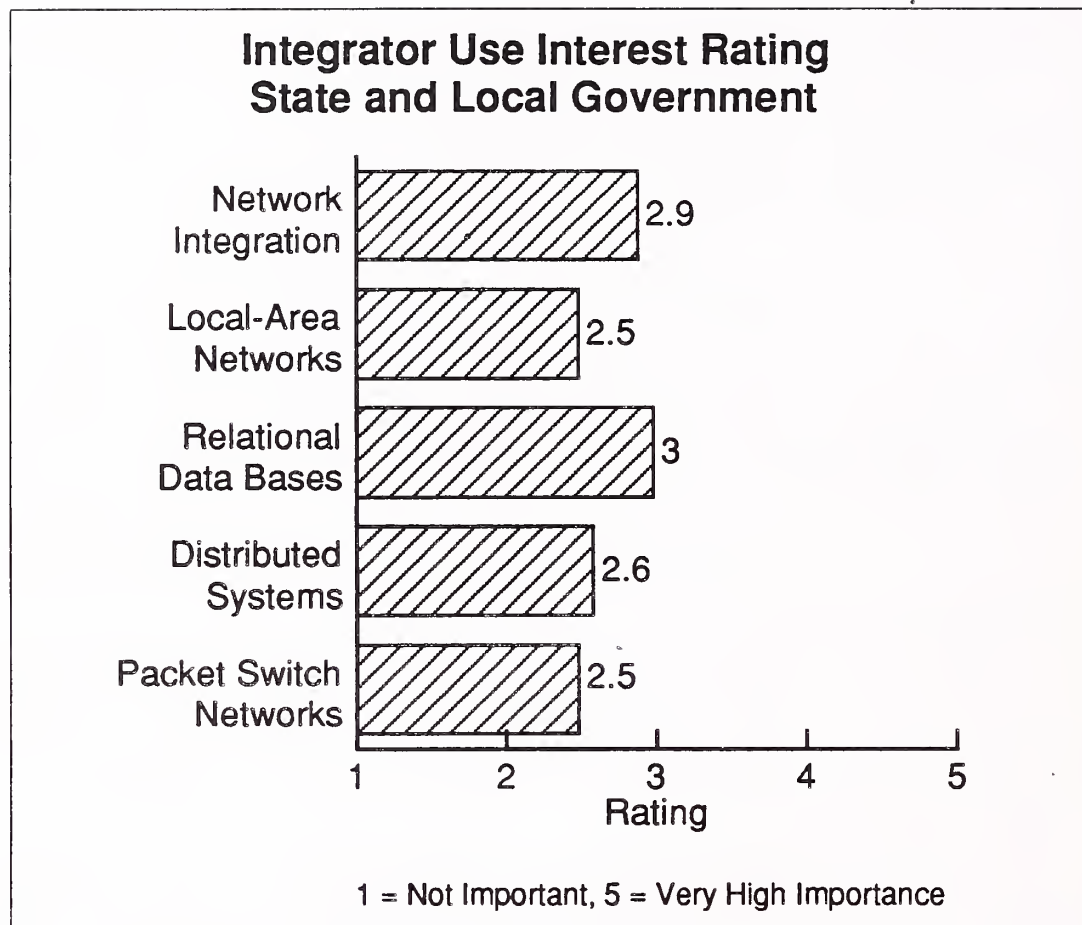
Unfortunately, the state and local government market is large (approximately 82,000 government units—less than 200 major markets) and geographically dispersed, presenting a significant problem for marketing and sales activities. The wide separation of opportunities also appears to foster greater dependence on local vendors, which may lack adequate support staffs and new technology expertise.

Despite the urgency of the need, many information industry vendors find it difficult to compete in this market because of many factors. The roles and influence of officials, IS management, and advisory groups are not always clear, and some decisions seem arbitrary or political. A common method of uncovering opportunities cannot be applied to all state and local governments. Procurements practices vary between governments and agencies. Large sales forces and research-based services are ineffective in comprehensively covering the magnitude of the market.

Vendors with sales organizations that market their technical specialties in specific application areas such as licensing, court administration, public safety, etc., are more effective in the market. Many companies have found that traditional geographically based marketing is not as effective in demonstrating capabilities and responding to RFPs.

The impact of federal budget deficit controls is felt down the line in counties and districts previously supported by the local presence of military and civil federal facilities. Proposed closures of military installations and reduction of civilian agency facilities will reduce or re-emphasize near-term CSI prospects in some states and local government areas. Health and social service systems needs may increase to accommodate rising unemployment rates, while the volume of other municipal services, such as transportation functions, may decrease.

EXHIBIT IV-21



4. CSI Forecast

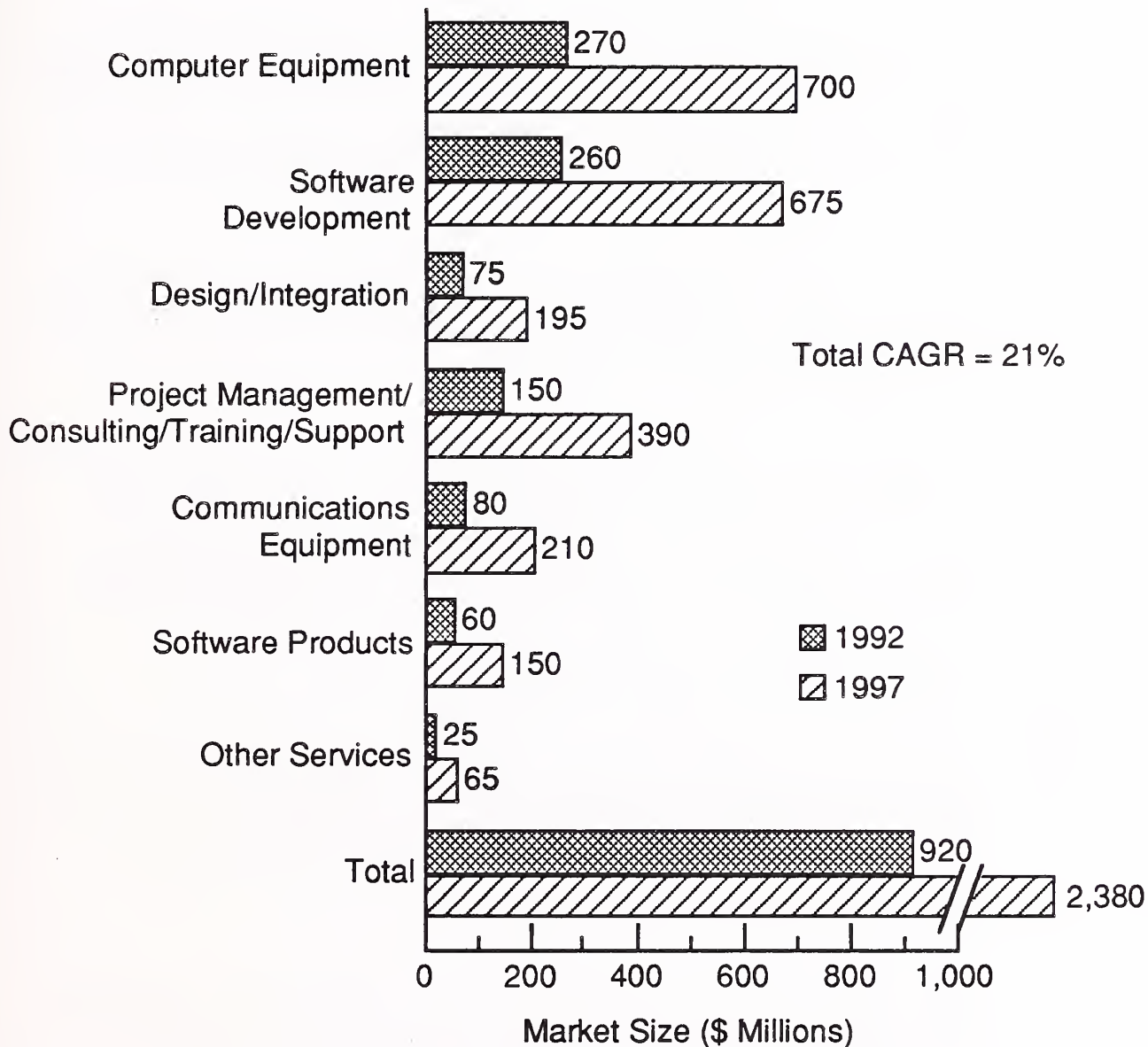
Exhibit IV-22 shows that the forecast for this sector places state and local governments as the second largest CSI opportunity market after discrete manufacturing. This sector is expected to grow to \$2.4 billion in 1997 from a base of \$920 million in 1992—a CAGR of 21%.

Computer equipment is the largest component, at \$700 million in 1997. This figure includes \$210 million for communication equipment in 1997. Software development continues to show the second largest growth prospect, at \$675 million by 1997. Off-the-shelf software purchases will only account for \$150 million by 1997.

The top five CSI vendors in this market are Andersen Consulting, CSC, EDS, IBM, and SHL Systemhouse. The state and local government sector is now viewed by many federal SI vendors as an expansion market.

EXHIBIT IV-22

State and Local Government Industry Forecast 1992-1997



Data may not total due to rounding.

I Telecommunications Industry

This sector is composed of the major providers of telecommunications—AT&T, MCI, Sprint, GTE, WilTel, Contel, the Regional Bell Operating Companies (RBOCs)—independent local exchange carriers, long-distance resellers, 800 and 900 services, and cellular operators as well as companies providing broadcasting, cable TV, cellular telephone, and optical fiber

and satellite networks. As the media available for information transfer become more varied, this sector may be better described as the electronic communications industry.

1. Industry Forces

The telecommunications industry continues to post nominal growth overall, but this is beginning to change. Vendors such as AT&T and MCI report substantial gains, and subsectors such as cellular phone and VSAT (very small aperture transmission) show significant growth potential. As yet, they do not reflect any substantial impact from the slowdown in the economy.

Though substantial investments are being made, the industry is still in a holding pattern until the next round of deregulation occurs. Most RBOCs are waiting to provide more than gateway services; meanwhile, independent companies are positioning themselves to be end-to-end providers of information services.

One major development by IBM is the formation and funding of an autonomous division to deliver information services into the home. This division has initial funding in excess of \$100 million. Now that the majority of homes are connected to a cable system, this provides high-bandwidth access for a multitude of data service offerings.

2. Impact on Information Systems and Services

In addition to the competition that deregulation fostered, Bell telecommunications companies lost a major source of IS support when they were separated from AT&T. This lost capability is now replaced by in-house capabilities or by external contractors. Bell companies also lost data-processing resources to cost-cutting measures, creating even greater opportunities for CSI vendors.

The new and emerging information carriers—such as cable, TELETEX, and cellular systems—are already using IS to operate billing, traffic and programming management, maintenance scheduling, and marketing programs. These carriers need assistance in providing the capability for planning, flexibility of services, and connectivity between operating elements.

AT&T and other telecommunications companies view the SI market as a potential business opportunity. At the same time, other telecommunications companies are clients of other SI vendors. As the RBOCs enter non-regulated business areas, they need business systems substantially different from those of the parent company.

3. CSI Potential

Telecommunications firms, although few in number, tend to undertake projects that are significantly larger than other industry segments. These characteristics tend to be offsetting, making this sector moderately attractive in terms of overall expenditures.

Hardware requirements tend to be below average, whereas custom software development efforts and the design and integration activities required to connect components are quite large. These expenditures, as a proportion of the typical project, are above average.

Telecommunications companies are attractive to CSI vendors because the program management methods provide the project discipline so frequently missing in recently deregulated businesses. These organizations are more likely to contract for project management skills than try to supplement their own in-house capabilities, as noted in Exhibit IV-23.

EXHIBIT IV-23

Key Factors in Telecommunications Industry

- Positive
 - Internal lack of project discipline
 - Network integration opportunities
 - Widening range of services requiring support
 - Need for EDI and AI-based systems
- Negative
 - Industry restructuring delays projects
 - Perceived in-house technical skills
 - Highly unionized work force
 - Foreign vendor interest

Network integration and micro/mainframe links are important considerations in most projects; office information systems and voice/data integration are not. Telecommunications vendors believe they know more about network integration and management than the non-communications CSI vendors. These same companies often underestimate the difficulty in integrating the computer-related aspects of an SI program.

Among the services that communications suppliers desire for improved operations support are EDI, expert systems and service modeling, and AI-based service control systems.

Restructuring of the industry and the entry of a new type of competitor have narrowed profit margins and delayed the early availability of investment funding needed to initiate CSI projects. The regular telecommunications suppliers believe they have the necessary in-house technical skills to complete integration projects.

As noted in earlier SI investigations of the success factors, automation and integration projects can change the way the organization works, introducing culture shock to the users. The highly unionized work force characteristic of this industry can provide serious opposition to the introduction of new systems that may appear job threatening. This can also lead to a clash between the cultures of the client telecommunications company and the vendor SI company.

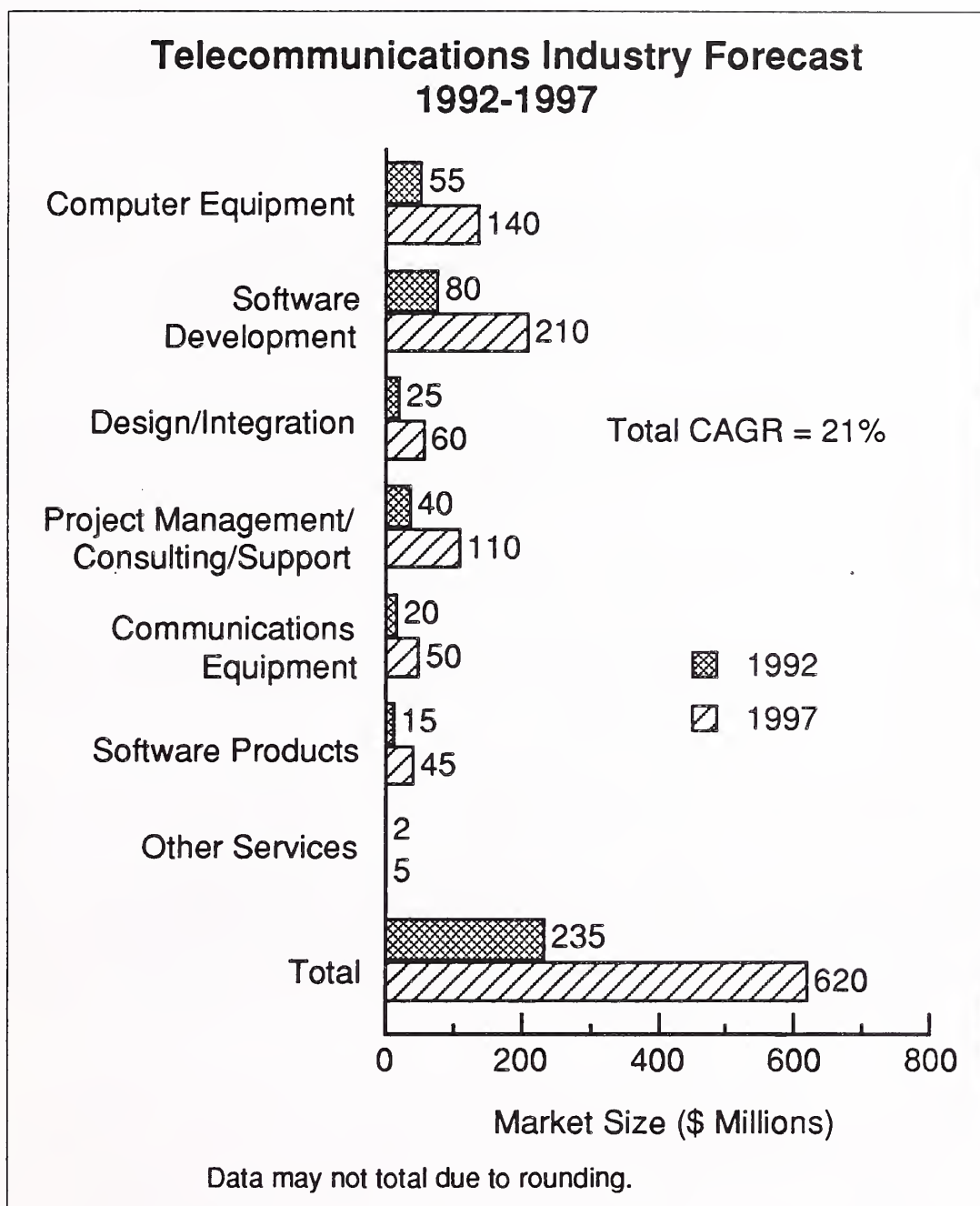
Foreign vendor interests in the U.S. domestic market may involve importation of their own systems integration people, instead of seeking U.S.-based SI vendor assistance. The level of impact will depend on the success of these foreign firms.

4. CSI Forecast

The forecast for this sector shows growth from a base of \$235 million in 1992 to \$620 million of annual expenditures for CSI by 1997 as shown in Exhibit IV-24. The CAGR of 21% is above the CSI average. As noted in the earlier analysis, custom software development is expected to be the leading component, with only a small amount of off-the-shelf software applicable to this market.

Given the limited number of major establishments, programs already started, and a parochial attitude regarding some CSI skills, this can be a difficult market to penetrate. Computer manufacturers and industry-specialized professional services vendors—e.g., CSC, EDS, Hewlett-Packard, IBM, SHL Systemhouse, and Unisys—are the prime CSI competitors.

EXHIBIT VI-24

**J****Transportation Industry**

This sector is composed of airlines, railroads, trucking, and other transportation including shipping, mass transit, postal, and pipeline services.

1. Industry Forces

The transportation industry continued to perform poorly in 1991 because of the downturn in the economy, environmental concerns, and increased oil prices. All transportation industry segments are affected by the economic slowdown because they are closely linked to the general economic trends of the U.S. economy. However, some areas are showing innovation and profitability.

Increased use of less-than-full truckload shipments and double trailers helped trucking to increase revenues. Possible rate discounts could continue to cut margins. Restructuring and mergers continue to contribute to a decline in the industry revenues and profits.

Air cargo and air express competitors have added automation, extended data communications, and additional bar-code readers to their arsenal of competitive weapons. Intermodal shipping companies that combine rail, road, and water transportation are increasing, with several companies employing sophisticated load-modeling tools to improve efficiencies.

Transportation is a capital-intensive industry. Lower interest rates have helped to mitigate the negative effects of the poor economy. Reduced availability of capital has also restrained new entrants to this industry.

2. Impact on Information Systems and Services

Limited growth in IS expenditures is expected as transport firms try to control costs and remain competitive. Productivity and efficiency are paramount in reducing personnel costs. IS organizations remain small and productive.

Part of the strategy is replacement of personnel with technology-driven systems. Technology lowers the cost of overall service by reducing labor costs and, at the same time, improves the response speed required to remain competitive. Systems are necessarily communications intensive. Travel reservations systems, crew and maintenance scheduling, and route and load optimization modeling are the current backbone applications of the industry.

These systems, when properly designed, provide management with more accurate and timely information for statistical analyses of operations data, rapid response to changing market prices, cost savings of labor and fuel, carrier scheduling, and sales/marketing planning and analysis. Yield management systems contribute to maximizing revenue. The overnight delivery industry segment could not exist without the latest in integrated system technologies.

3. CSI Potential

The deregulation of this industry fostered a competitive environment that demands the use of automation technologies as a competitive weapon. Price wars based on progressive tariff structures have cut so dramatically into revenue that funds for major projects are limited. The industry includes only a limited number of large transportation companies, which significantly reduces the attractiveness of this industry for CSI. Exhibit IV-25 lists the key positive and negative factors in the transportation market.

EXHIBIT IV-25

Key Factors in Transportation Industry

- Positive
 - Competition/changing rates require support
 - Competition of intermodal systems
 - Network design/integration requirements
 - Move to independent traffic management
 - Automated systems as competitive tools
- Negative
 - Few opportunities outside of airline segment
 - Little growth in IS expenditures
 - Limited use of outside services
 - Limited capital investment available

This sector has major opportunities and projects that tend to be larger than the average of other industries. Major expenditures in these large projects involve communications hardware and design/integration services that can support a strong industry need for end-to-end systems to maximize customer satisfaction and repeat business.

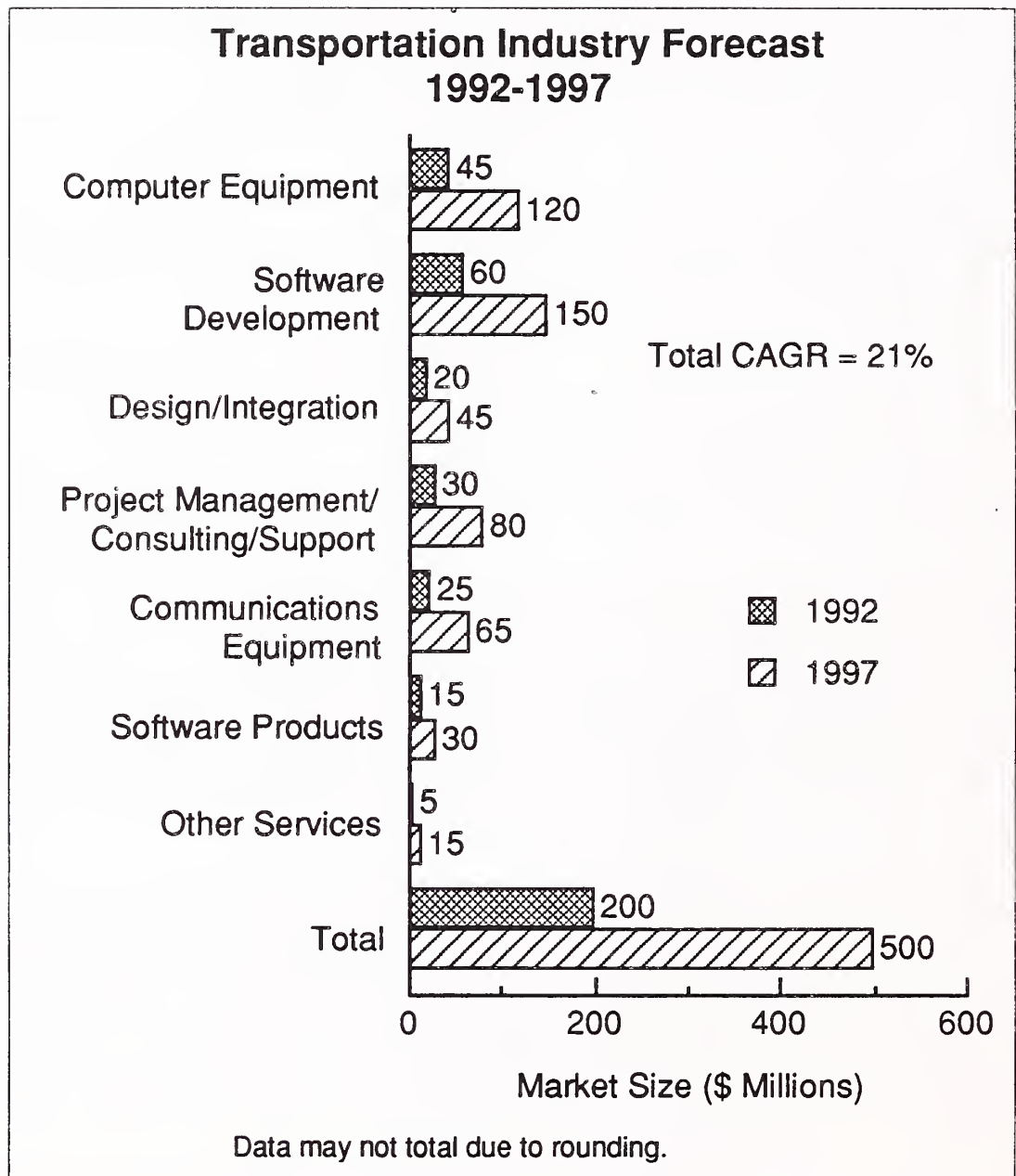
CSI will be attractive to client organizations because changes to complex systems can be made easily and without interrupting ongoing operations. CSI vendors can offset the recognized technical weaknesses and limited capabilities in project management in internal staff. Vendors should be prepared to address the concern of many IS managers regarding the directions of IBM architectural development and the hardware that is likely to survive.

The most unattractive features of this market are the limited number of projects and the low level of anticipated expenditures outside of the airline segment. Except for major airlines, the industry is not economically capable of supporting many large SI programs. The other transportation industry segments are not particularly accustomed to the integration of technology or the need to acquire development expertise.

4. CSI Forecast

The forecast for this sector, seen in Exhibit IV-26, shows that from a base of \$200 million in 1992, CSI yearly expenditures are expected to grow to \$500 million by 1997, a CAGR of 21%.

EXHIBIT IV-26



The principal competition for CSI programs will come from computer manufacturers like IBM and Unisys, which team with smaller, industry-specific vendors. Andersen Consulting, EDS, Lightnet, Covia, and Rockwell have also become evident in this marketplace. The number of significant competitors is expected to remain small.

K**Utilities Industry**

This sector includes the energy market—electricity generation and coal/nuclear/hydro/oil/solar/geothermal/gas energy production—water utilities, and sewage/waste disposal and treatment, but excludes telecommunications.

1. Industry Forces

The utilities industry vertical market includes the electric, gas, and water/sewage/waste disposal segments. Electric utilities generation and transmission can be investor-owned, cooperative, municipality-owned, federally owned or state projects/power districts. Natural gas utilities consist of pipeline companies and distribution companies. Water/sewage/waste disposal can be publicly, municipally, or privately owned.

Most utilities are regulated monopolies. In return, the utilities accept an obligation to serve the public. The rates a utility can charge are set by a public utility commission and are targeted to a reasonable rate of return. Of the approximately 59,000 utilities in the country, only the largest 200 that have mainframe computers are prospects for SI engagements.

There are three primary functional areas for computerization within a utility: commercial applications, engineering applications, and operations functions. The commercial applications are the normal set of business functions with an emphasis on high-volume billing and collection. The engineering systems are oriented to the physical aspects of the utility with an emphasis on facility design and planning. The operations functions are the process control systems to monitor the production and distribution processes.

The utilities industry is highly influenced by the cost of capital (interest rates) and cost of fuel (coal, gas, oil). Creating additional capacity is a very long-range and expensive process. The fluctuations in fuel costs are smoothed by using long-term, fixed-price purchase contracts.

2. Impact on Information Systems and Services

Utilities necessarily use a very conservative management style. Thus, very few utilities have made appreciable progress in exploiting the power of modern information technology. This problem is compounded by the rapid change in technology and the complexity of utility information requirements.

IS has been forced to shift from a comfortable day-to-day operating orientation to one where IS must meet dynamic demands within constrained budgets. IS must help enhance operating efficiency and productivity, making the utility more profitable and reducing costs, while

increasing the ability to serve users. Cost containment remains the principal focus of all operations support activities.

IS management's attention is turning to data communications requirements that make systems available to users, even at remote locations. Many of the support systems are being changed from batch to on-line. Issues regarding the proper use of advanced technologies and distributed versus central processing are being addressed in new systems.

3. CSI Potential

Utilities are discovering the use of technology for maintaining a competitive edge. Customer files are becoming marketing data bases to improve service to customers and to market new products. AI-based automated process control is helping to minimize materials consumption and optimize resource applications, as noted in Exhibit IV-27.

EXHIBIT IV-27

Key Factors in Utilities Industry

- Positive
 - Increasing competitive use of technology
 - Hardware/software obsolescence
 - Automation of generating plants
 - Automated electrical grid control
- Negative
 - Day-to-day orientation of IS
 - Limited number of establishments
 - Financial constraints
 - Modular, rather than total, view of system

However, utilities are much more interested in long-term hardware planning and the curtailment of rapidly escalating operations and management costs associated with outdated equipment. Corporate management appears to be more aware of the role of IS in responding to the growth of end-user computing, the need for better data administration, and the collection of data for demonstrating compliance with federal and state regulations. End users are buying more automated data processing (ADP) power and making the IS director more of a data manager and technical coordinator than head of information processing.

Despite long-term opposition to the use of automation to remove, or drastically reduce, the role of people in controlling utility operations, management is employing more information processing equipment to monitor and control power-generating plants and manage distribution grids, including interconnections with other utilities.

Among the negative factors of the expansion of CSI in this market is the continuing day-to-day orientation of IS and the reluctance of CSI to expand beyond current capabilities. Another factor is the limited number of large utility establishments, particularly in gas and electricity.

Under the consumer-oriented constraints imposed by regulatory and environmental authorities and the resultant low ROI, investments are limited and prevent implementation of a number of desirable improvements in data and control systems. Operating executives have modular, rather than total, views of the systems; their perspective is restricted to raw materials, processing, maintenance, or customer relations. Traditional views are slow to be modernized in this basic industry.

Some new technologies have a potential for a positive impact on the major utilities. Successful implementations of imaging/graphics include engineering drawings, maps, and nuclear power plant documents. The commercial systems are benefiting from the use of relational data base management systems, creating centralized customer support systems. Artificial intelligence applications of expert and knowledge-based systems have found substantial acceptance and use in the operational areas. In many cases, the utilities rely on SI vendors to integrate the new technology applications.

4. CSI Forecast

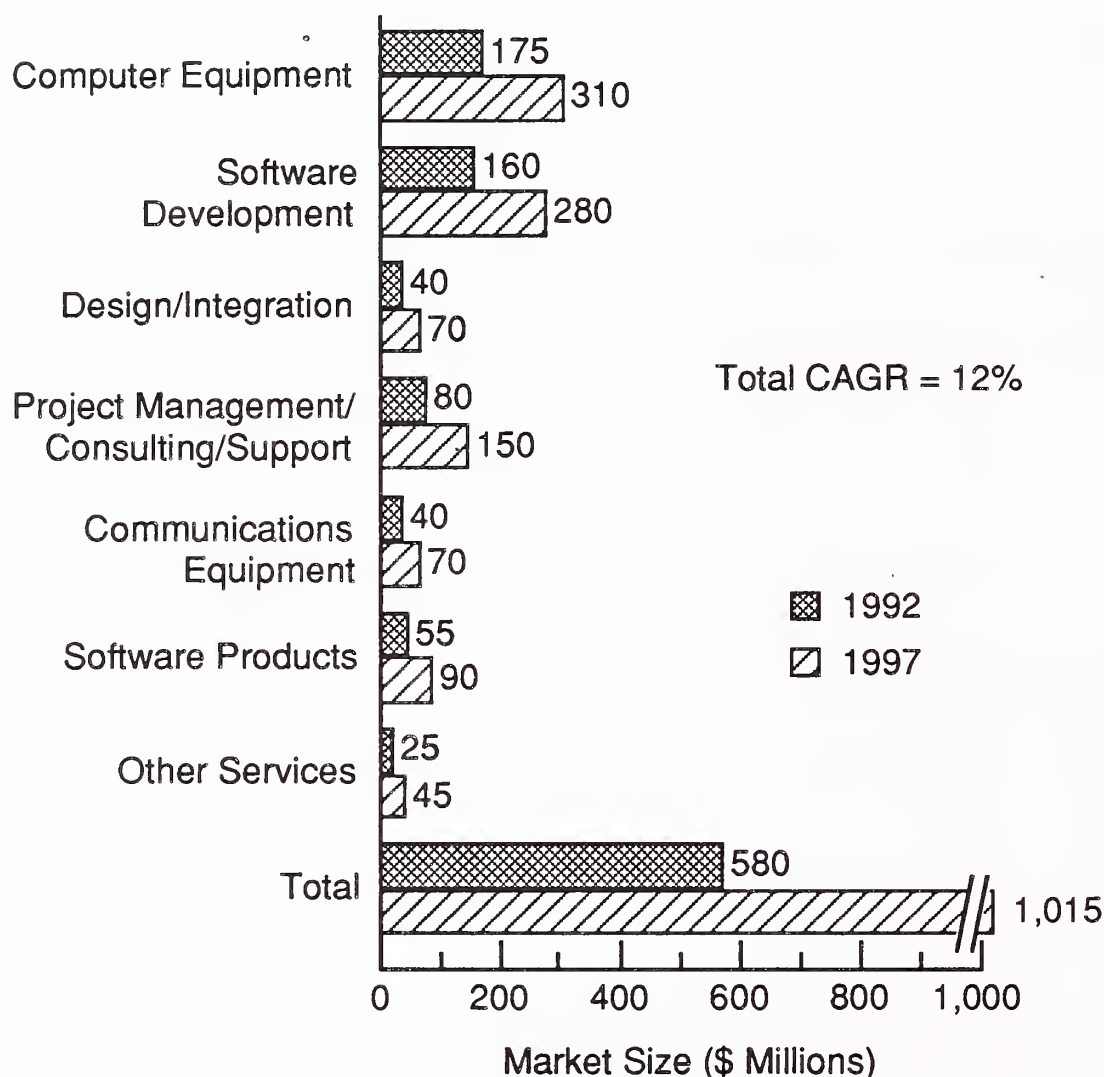
Exhibit IV-28 shows that the forecast for CSI in this sector is approximately \$580 million in 1992. By 1997, these expenditures will climb to \$1,025 million, at a CAGR of 12%.

IS hardware and custom software development expenditures will dominate most projects. The large utilities have a strong interest in modernizing their systems to include applications for estimating user demand for electricity, gas, and water. Equally strong are the interests in developing and implementing automated systems for the collection of usage data.

Since many operations and accounting applications are new, there will be minimal demand for off-the-shelf software packages. Customized software will be needed for hazardous conditions monitoring, load-and-exit control, distribution and collection station control systems, and more modern customer service systems.

EXHIBIT IV-28

Utilities Industry Forecast 1992-1997



Data may not total due to rounding.

In view of the limited opportunities in this market, only a few CSI competitors are prominent. IBM leads among the hardware-based vendors; Telenet appears in network and distributed processing projects. Andersen Consulting, Bechtel, CSC, Fluor, Systems Control, EDS, Telenet, and TRW appear as hardware-independent systems vendors. There are also a number of industry-unique vendors, including Ferranti, SCI, Harris, and Stag. CDC has exited the market by selling its Empros division.

L**Wholesale Distribution Industry**

This sector includes establishments that sell goods to retailers or industrial/commercial/institutional groups acting as brokers.

1. Industry Forces

The wholesale distribution market includes a number of widely different submarkets with equally different growth rates. Some very large wholesale establishments are leading-edge users of information technology. However, many more—in the thousands—are very small and do not employ the technology. There are three types of firms:

- Independent distributors (merchant wholesalers), which account for about 55% of sales
- Manufacturer's sales branches, which generate about 35% of sales revenues
- Agents and brokers, which handle somewhat less than 10% of sales and whose numbers are diminishing

Measures to ease the pressure on margins include increased inventory turnover, secured high-volume purchases, longer and larger purchase commitments, and automation improvements that contribute to the bottom line by enabling rapid response and deployment of products. Better communications will accelerate the information flow between wholesalers, retailers, and manufacturers/sources of goods. Back-office use of computer-to-computer order processing will reduce the time needed to locate and deliver merchandise.

Technology and market trends are squeezing the wholesale industry. In some cases the wholesalers themselves are becoming retailers by opening mega-stores or warehouse stores. Manufacturers and retailers who are the clients of wholesalers are demanding faster response to match their JIT and high-turnover systems. The wholesaler that can respond and become electronically integrated with clients will achieve a substantial competitive advantage. Some retailers are using systems to completely bypass the traditional wholesaler. Smaller wholesalers who add little value will quickly disappear.

Automation is viewed as a matter of survival by the independents and manufacturing branches. The leaders forecast an aggressive use of computer and communications technology.

2. Impact on Information Systems and Services

IS management in the medium- to large-sized wholesale organization is faced with meeting rising management expectations as well as satisfying increasing demands for the integration of data and applications while managing the limited technical investment. The mission is complicated by the traditional instability of the sales-oriented organizational environment and its varying use of information services.

IS is also faced with the increasing importance of data integrity in an environment where PCs are beginning to proliferate. Proposed solutions must be proven in the market or submarket to support early payoff. Integration problems abound from the piecemeal installation of hardware and packaged software, supported by in-house or short-term consultant professionals.

Productivity of the IS staff is frequently impacted by varying backlogs of short-term or one-time application demands. Users in sales, management, and traffic demand increasingly complex tools, such as new workstations, upgraded applications, and on-line teleprocessing to gain a competitive edge. To meet these demands, IS is looking to applications that run on less expensive computers, expanded connectivity, and network techniques such as EDI.

Conversely, the cost constraints limit the level and availability of the in-house staff to address these issues with the latest technology, while meeting day-to-day service requirements. In addition, IS managers have difficulty gaining meaningful insight into future industry directions that would influence the selection of information technologies.

3. CSI Potential

There are about 30,000 wholesale distributors with \$5 million to \$20 million in sales per year; 6,000 have revenues in excess of \$25 million and 1,000 or more employees. These firms are expected to be the principal sources of CSI opportunities.

Near-term industry interests will emphasize improving and integrating external and internal communications. EDI between trading partners in retail, wholesale, and manufacturer/merchandise sources can be provided by network service firms like GE Information Services (GEIS), ADP, and McDonnell Douglas, or incorporated into new dedicated networks as part of upgraded data systems. Very few wholesalers have integrated their EDI with their internal business systems. Exhibit IV-29 lists the positive and negative factors affecting SI in this vertical industry market.

EXHIBIT IV-29

Key Factors in Wholesale Distribution Industry

- Positive
 - Network requirements for retailers
 - Potential for EDI applications
 - Strong interest in inventory controls
 - Automation needed for survival
- Negative
 - Cost pressures/low margins
 - Smaller than average project expenditures
 - Widely different submarkets
 - Many small wholesalers

Improvement in control of inventory turnover rates to reduce financial pressures and risks is expected to gain early funding. Only a small number of wholesalers are currently employing distribution resource planning (DRP) with inventory modeling, automated warehouses, and on-line transaction processing (OLTP) resources. More of the firms are expected to move in this direction to remain competitive. Automation is needed for survival, and the more progressive managements will adopt CSI programs, if the contribution to the bottom line can be demonstrated.

Like retail distributors, wholesale distributors have not made use of outside services, except for hardware maintenance and essential software support. In an industry that is largely guided by merchandising intuition, uses relatively small IS staffs, and is financially constrained by narrow margins, there have been smaller than average CSI project expenditures.

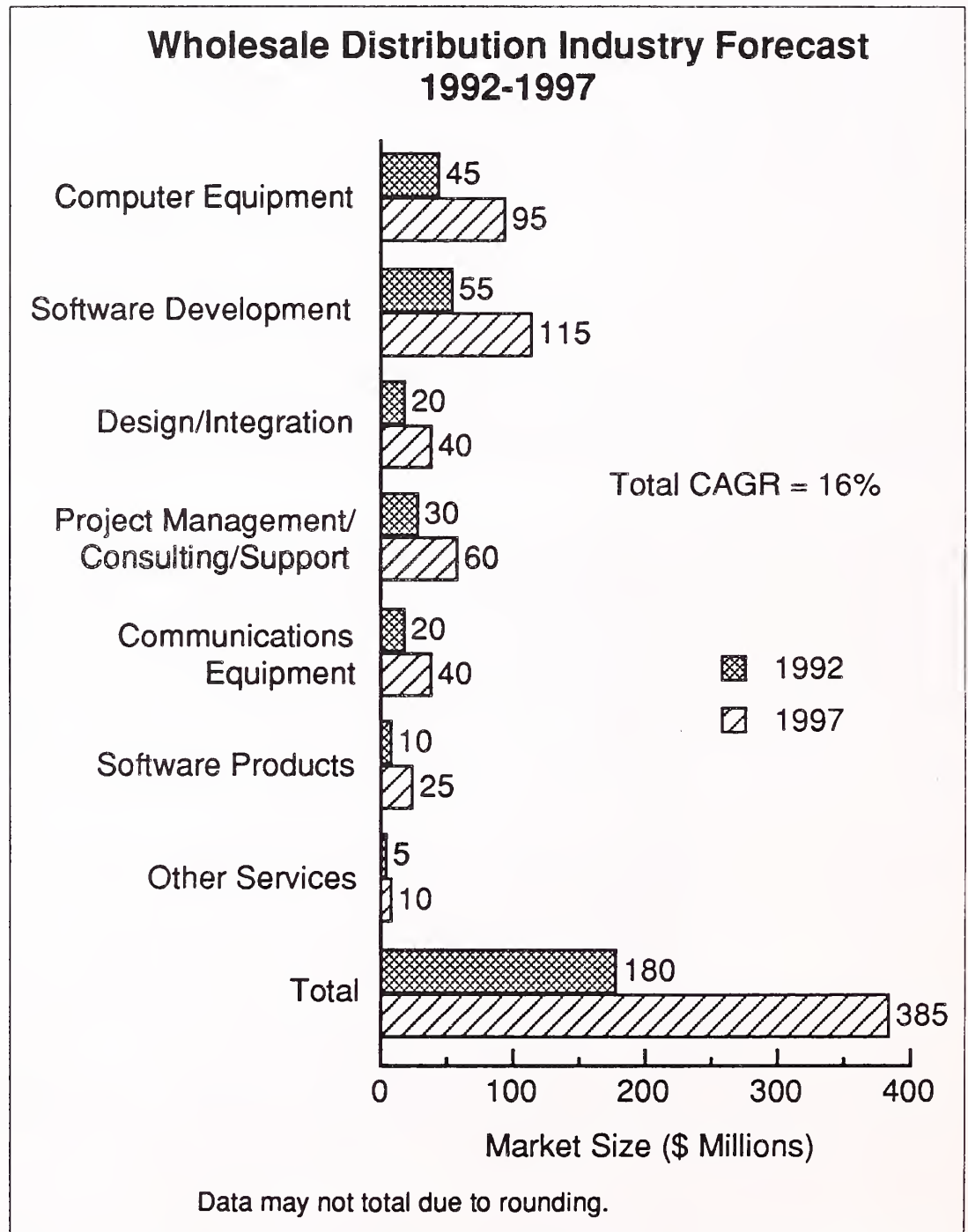
Part of the problem is attributable to the existence of widely different submarkets, where CSI vendors' experience might be seen as relatively narrow. Each submarket sees itself as having unique requirements that can only be addressed by knowledgeable specialists.

From an information technology viewpoint, however, this market offers broad applications challenges that could be addressed by technology and tools already employed successfully in other markets. The marketing of CSI capabilities may have to be shaped to offer phased improvements over time to stay within the stringent cost envelope of the industry.

4. CSI Forecast

The wholesale distribution industry SI market is slightly over half the size of and growing more slowly than the retail sector; the wholesale distribution sector will be about one-half the retail sector's size in 1997. From a base of \$180 million in 1992, this sector will increase to \$385 million in 1997, a CAGR of only 16%. Details are presented in Exhibit IV-30.

EXHIBIT IV-30



Similar to the retail sector, software development will be the most significant component, with a correspondingly smaller growth of software products resulting from the wide diversity of submarket needs. Although computer hardware will be the second largest CSI component, it reflects the industry's interest in employing newer but less expensive equipment. Networking will become a more important component in wholesale distribution SI engagements in the latter years of the forecast.

The relatively low value of CSI programs to date, and the widespread nature of this industry, create a market not dominated by any particular vendor. IBM provides most of the platforms and has managed a number of small projects. EDS has also ventured into this market. Smaller firms with some interesting assignments include Innovative Teletronics, TSC, Sentinel Computer Corporation, Systems Unlimited, and CRT Distribution Systems, Inc.

M

Business Services Industry

This sector includes real estate companies, business and legal services firms (excluding hotel reservations), and firms providing engineering, accounting, research, management and related services.

1. Industry Forces

A transition is underway in the U.S. from an industrial to a service-oriented economy. According to the Bureau of Labor Statistics, the business services sector is expected to add 2.7 million new jobs between 1988 and 2000. The 2.7 million increase represents almost 1 of every 6 new wage and salary jobs added for all industry sectors between 1988 and 2000.

This growth is in contrast to manufacturing employment, which is projected to shrink slightly, from 19.4 million to 19.1 million at the turn of the century.

Reasons for the trend toward a service economy include the following:

- Big businesses are increasingly using outside business services—for tax work, accounting, inventory control, etc.—in order to contain costs and maintain flexibility.
- The number of small companies is growing; smaller companies do not have a full spectrum of internal resources or knowledge. Therefore, they hire outside sources to set up their books, do their advertising, handle marketing, etc.

- More expertise—more than companies necessarily need on a full-time basis—is required as the world becomes more complex. It is not cost-effective to provide in-house resources to meet every demand in the course of doing business.

Some forces affecting the business services industry are the general economic slowdown, globalization, and expansion into homogeneous markets. With the U.S. economy facing an economic slowdown, companies are looking to outside business services to reduce their internal costs and keep their businesses focused and flexible.

As the growth of U.S. manufacturing goods slows, interest is shifting toward global markets. Larger business and technical service companies are becoming more international in scope. Smaller business service companies will also gain from this global expansion if larger local businesses pursue the foreign opportunities.

CPA firms and manufacturing entities, such as computer vendors, are expanding into consulting services. These businesses are diversifying into homogeneous markets. The same type of occurrence can be seen in the full-service types of expansion offered by large law firms.

2. Impact on Information Systems and Services

Although this vertical industry market is characterized by small businesses and partnerships, the larger firms and associations depend on IS for services ranging from mailing list processing to engineering support. Much of the IS support is provided by outside firms or is based on PCs and workstations.

Historically, this industry has been served by mainframe, turnkey, and applications software vendors. The turnkey vendors have recognized the new opportunity and are diversifying into systems integration. Down-sized, client/server, desktop, and LAN systems are extremely attractive in this market. Although the typical SI program will be rather small, there will be a large number of engagements.

Business services have been reluctant to invest in information systems. Today's systems that combine power and ease of use are receiving a higher level of acceptance. INPUT is forecasting the business service industry as the fastest growing SI vertical market segment.

Continued pressure to operate more efficiently is causing some old systems and software to be upgraded. Lack of technical expertise within this industry will continue to slow any major change.

3. CSI Potential

Although not sharply focused, there are new demands for networks and on-line data bases, as noted in Exhibit IV-31.

EXHIBIT IV-31

Key Factors in Business Services Industry

- Positive
 - New demands for networks and data bases
 - Markets creating new system demands
 - Increasingly complex tax laws
- Negative
 - Few large enterprises
 - Economic uncertainty
 - Few large-scale opportunities
 - In-house control of large client systems

Demand for more responsive services appears to be creating new system demands, however. On-line systems, with supporting data bases, will be needed to comply with increasingly complex tax laws at all levels of government. Record retention and multiple filing requirements can be expedited with better data processing capabilities.

On the negative side, even the largest segments present few large-scale opportunities. In some sectors (Big Six accounting firms, large engineering companies) the capabilities exist for in-house management of major projects, which will lessen the size of the CSI market even further. New technologies are gaining wider acceptance, but there appears to be minimal use of, or opportunities for, automation.

In addition to the apparently limited opportunity for extensive automation, marketing to the business services industry is difficult. The aggregate of all spending may appear to be high, but there are few businesses large enough to require large systems integration programs.

As an example, the majority of the industry's companies must be characterized as small. Of the estimated 75,000 legal firms only 2% have more than 25 employees and only 750 firms have more than 55 employees.

There are an estimated 40,000 architectural firms, but 85% have less than 6 people. There are less than 100 firms with 500 people or more.

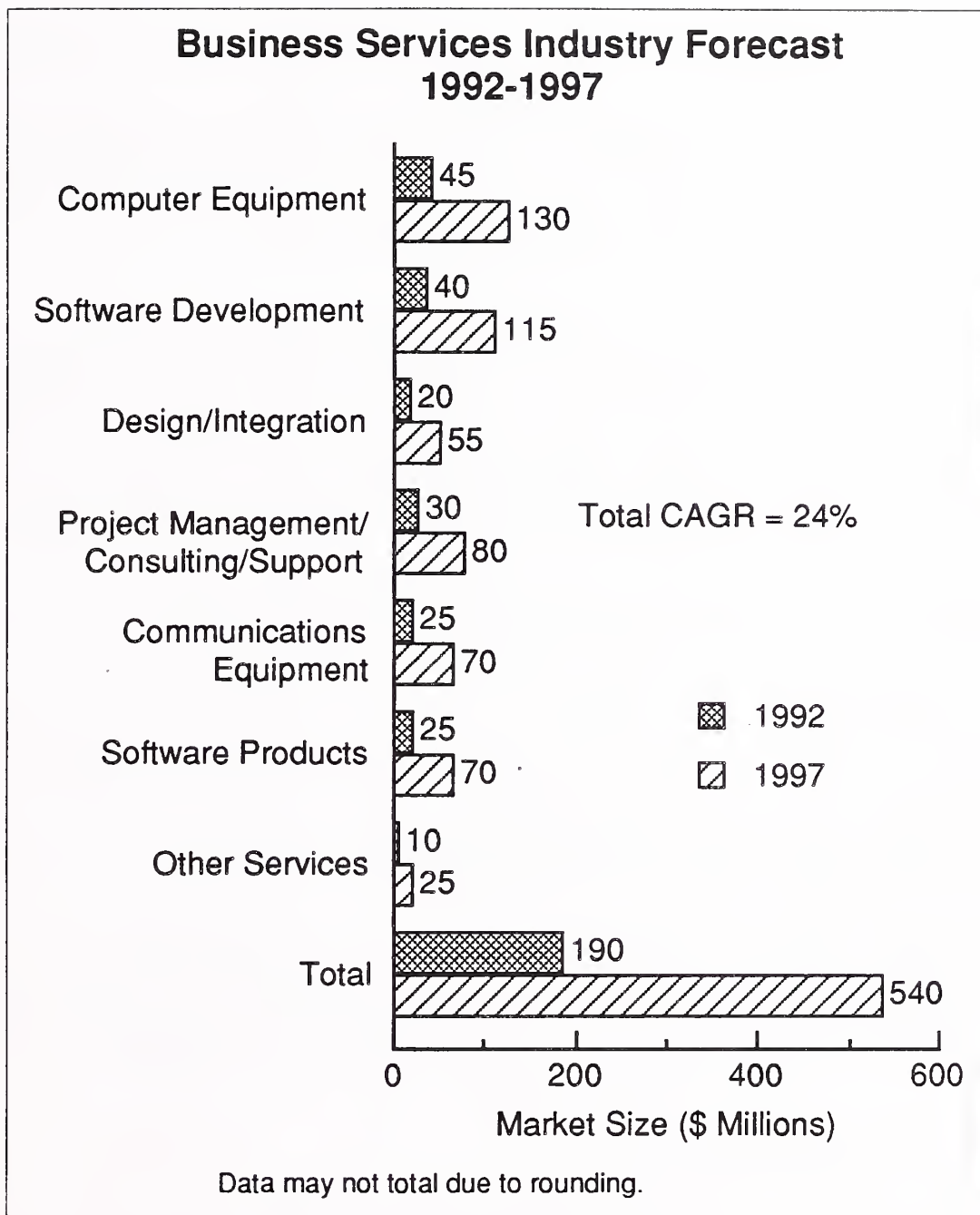
Many of these companies work on a basis of personnel cost and billable hours. There are systems that can be provided to improve productivity, and the quality of the work product can be justified.

4. CSI Forecast

The forecast for this sector, Exhibit IV-32, shows continued limited CSI potential, though growth is 24% CAGR, with only \$540 million in yearly CSI expenditures by 1997 from a small base of \$190 million in 1992.

This growth represents prospects for specialized software development and new hardware, primarily for the new workstations with the power of mainframes for desktop publishing and graphics. The communications hardware component is comparatively larger than in other sectors because of strong network interest.

EXHIBIT IV-32



There are not many SI vendors in this limited market. IBM is the principal computer equipment provider. GTE and some small communications houses provide network integration. Grumman Data Services (GDS), and SHL Systemhouse have installed integrated systems in the marketplace and can be expected to continue. VARs and turnkey vendors with subsegment industry specialization will successfully offer SI services.

N

Federal Government

This sector includes defense and civil departments, independent agencies, and public corporations, but excludes weapons, platforms, and classified applications such as embedded computer systems, intelligence, and tactical command and control systems.

1. Industry Forces

Most of the data in this section was gathered as part of INPUT's ongoing Federal Systems and Services Market Program and Federal Information Technology Procurement Program. Trends, market size, and growth rates are based primarily on government budgets and IRM plans and in-depth interviews with federal agency officials and the SI vendors serving the federal government industry sector. INPUT maintains a data base which includes most major SI procurements in process and awarded. A separate report, *Federal Systems Integration Market*, covers this industry segment in substantial detail.

The world and the U.S. federal government are being affected by a range of forces that make the future more difficult to forecast. The net effect of the forces discussed below is a pronounced reduction in the growth rate of federal spending in a number of subsectors, some of which directly affect prospects for the information industry.

The military establishment is facing a substantial reduction since the cessation of the cold war with the Communist bloc and democratization of the Eastern European countries and the U.S.S.R. However, strategic policy changes will be delayed by difficult political choices. The large and increasing federal budget deficit continues to cause agencies and Congress to carefully review all proposed major SI programs.

The U.S. trade imbalance continues to depress the value of the dollar. Continued farm subsidies will have an impact on budget reduction moves. The continuing depression of the real estate market, unregulated investments by S&L banks, and the inability to buy back junk bonds for leveraged buyouts have fueled a downward spiral of the economy. Economists agree that the U.S., and much of the world economy, is in the midst of a recession of an uncertain duration. Business cutbacks and failures will appear as lost tax dollars, severely retarding any federal budget support. Increased unemployment further reduces tax revenues and creates additional expenditures under entitlement programs.

The current administration and Congress have not developed an effective campaign for resolving mounting economic issues. In an election year both political parties are reluctant to make the difficult choices that are necessary to re-establish real economic growth. Federal resources cannot

adequately address the problems without threatening the country's fiscal health. In addition, the recession has pushed many state and local governments into a combination of budget cuts and tax increases. The 1991 joint budget package to reduce the deficit actually increased taxes with no significant spending reduction.

2. Impact on Information Systems and Services

Federal IS budgets aim toward greater functionality of the information resources. Most IS organizations are committed to maintaining quality support of their agencies, but they continually face rising service-level and applications demands, obsolescence of resources, and rising maintenance costs. A major share of existing software was custom developed by contractors and in-house staffs to satisfy applications that have since been extensively modified. These legacy systems are difficult to maintain and modify.

Hardware and software maintenance will continue to affect the availability of IS staff to start new applications development and to staff internal systems integration programs. Demands for technical assistance to end users equipped with PCs or advanced workstations are also reducing staff availability for new programs.

The government is transitioning from collecting and processing incredible volumes of data to the presentation of more readily understood information to support decisions. IS must acquire, store, and permit access to the enormous collection of information essential to agency operations and the public. Industry standards like POSIX and GOSIP support this transition, enabling interoperability and compatibility. Standardization of communications protocols and systems will continue. The federal government also creates de facto internal standards through megaprocurements.

Another evolutionary—but frequently debated—government process is the acquisition method used for information systems and services. Risk containment and cost-control needs support increased use of fixed-price contracts and closer scrutiny of procurements by vendors and oversight agencies. The Defense Department and other agencies impacted by protest delays are pressing for utilization of commercial buying practices. However, to date, they have made little progress.

The DoD is evaluating the potential savings of a massive consolidation of all of the data processing functions. This has caused a great deal of short-term uncertainty and postponement of some SI programs. If this consolidation does occur, it will create more SI opportunities. It is very difficult for the government to attract and retain the personnel capable of managing and performing major SI programs.

Although the agencies prefer the use of new technology and appropriate technical solutions, they are constrained by lower funding availability and congressional oversight demands. Budget limitations hinder agency realization of the advantages of new technological capabilities sorely needed to advance the functionality of the internal IS departments and improve agency mission accomplishment.

3. FSI Potential

The federal SI market is smaller than the combined commercial market, as agencies press for more flexible and advanced resources to meet rising executive, legislative, and citizen service expectations. Expenditure growth rates will decline in the 1990s but will continue at a positive level throughout the decade for the reasons shown in Exhibit IV-33.

EXHIBIT IV-33

Key Factors in Federal Government Market

- Positive
 - Productivity improvements
 - Technical staff shortages
 - Shared implementation risks
 - Information technology upgrades
 - Service demand increases
- Negative
 - Deficit-limited budget
 - Greater protest activity
 - Existing systems maintenance
 - Slow standards implementation
 - Extended implementation schedules

Agencies are looking for integrated systems that will improve the productivity of both staffs and facilities, without significant operating budget increases. Existing personnel policies and the heavy software maintenance load cause continued shortages of in-house technical staffs. To meet the service demands, implementation and initial operating support must come from commercial organizations.

Since there is always an element of uncertainty associated with the implementation of new information technology and higher capacity resources, the federal agencies moved to a policy of sharing implementation risks with the successful FSI vendor. Despite the risk of new service demands exceeding the capacity and capability of SI programs, federal procurement moved to the increased use of fixed-price contracts.

A major shift from defense to domestic emphasis is occurring. The civilian agencies are ill equipped to provide systems to manage new initiatives. The FSI vendors that supported the Department of Defense also have to re-align their efforts and adjust to civilian agency mission requirements.

User-based service demands continue to increase, steadily exceeding the ability of the in-house IS staff to satisfy the latest needs. In some cases, contractors are expected to provide full operational support for newly implemented SI programs for up to 10 years after acceptance.

Several factors tend to inhibit the FSI market, however. The two most significant are budget cuts to reduce the federal deficit and greater protest activity by disappointed bidders. Budget restrictions are forcing consolidation or outright cancellation of a number of agency-desired FSI programs. Increased protest activity is extending the procurement cycle, expending critical energies, and forcing agencies to delay planned system acquisitions for more careful review.

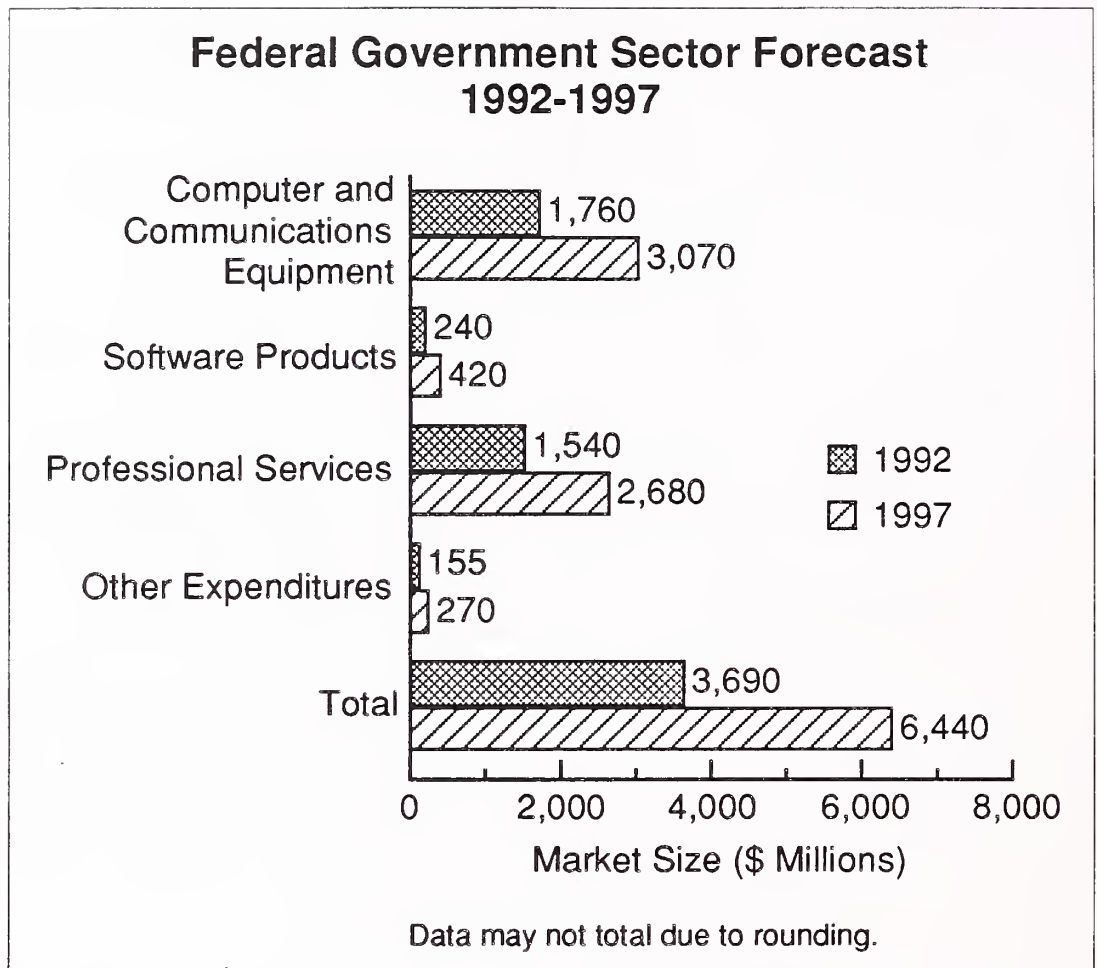
The cost of existing systems maintenance continues to rise, diverting support funds that are needed to acquire system upgrades and replacements.

Implementation of new information systems standards that foster greater competition and substantially improve connectivity between systems has not been as rapid as expected. Administrative and congressional mandates for 1992 should improve this situation. A wide variety of electronic transaction systems are being implemented. A separate report, *U.S. Electronic Commerce/EDI Federal Markets 1991-1996*, details these systems. Many of these systems are major SI programs.

4. FSI Forecast

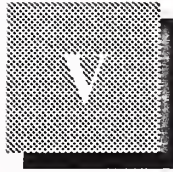
The federal government sector forecast for FSI shown in Exhibit IV-34 is expected to grow from a 1992 base of \$3.7 billion to \$6.4 billion by 1997, a CAGR of 12%. There are sufficiently unique applications in the government to justify, in the agencies' view, the high rate of custom software development.

EXHIBIT IV-34



Although 1991 expenditures continued to increase, the rate of that increase is slowing. This is partly due to delays in several defense projects under the Corporate Information Management (CIM) initiative. Several major civilian initiatives are advancing, however. Further, as already pointed out, the dramatic success of the Iraq war has improved technology's prospects.

The potential of FSI attracts an increasing number of systems integration vendors. Among the hardware vendors are IBM, Digital, Unisys, Harris, Control Data, Hewlett-Packard, and Tandem. BCS, GDS, Lockheed, Martin Marietta, Rockwell, and TRW are key aerospace firms visible in the market. Hardware-independent system firms include AMS, CSC, EDS, GE, Planning Research Corporation (PRC), and SAIC. The Big Six are represented by Andersen Consulting, Coopers & Lybrand, and Price Waterhouse. Communications firms are represented by AT&T, CBIS (Cincinnati Bell Information Systems), GTE, Northern Telecom, Sprint, and BT Tymnet.



Market Strategies and Recommendations

Systems integration is an exceptionally attractive market, but the attractiveness can obscure very real risks—risks to the company's finances and reputation should systems integration programs fail. Regardless of the reason(s) for failure and the source of the fault, the integrator must bear the brunt of the repercussions. The investment and importance of these projects to clients—and the publicity such projects receive—make it unlikely that failure will be overlooked by investors, potential clients, subcontractors, and competitors.

Success as a systems integrator requires the creation and imposition of careful marketing, opportunity qualification, disciplined bid preparation, and established program management practices. Diligent competitor evaluation, continuous presale development, and creation of a committed team in-house and with alliance partners are essential to achieve the rewards of completed systems integration programs. Vendors must also diligently assess, manage, and contain the inherent risks. These activities are not one-time activities. They require constant monitoring of the system integration plan and its execution.

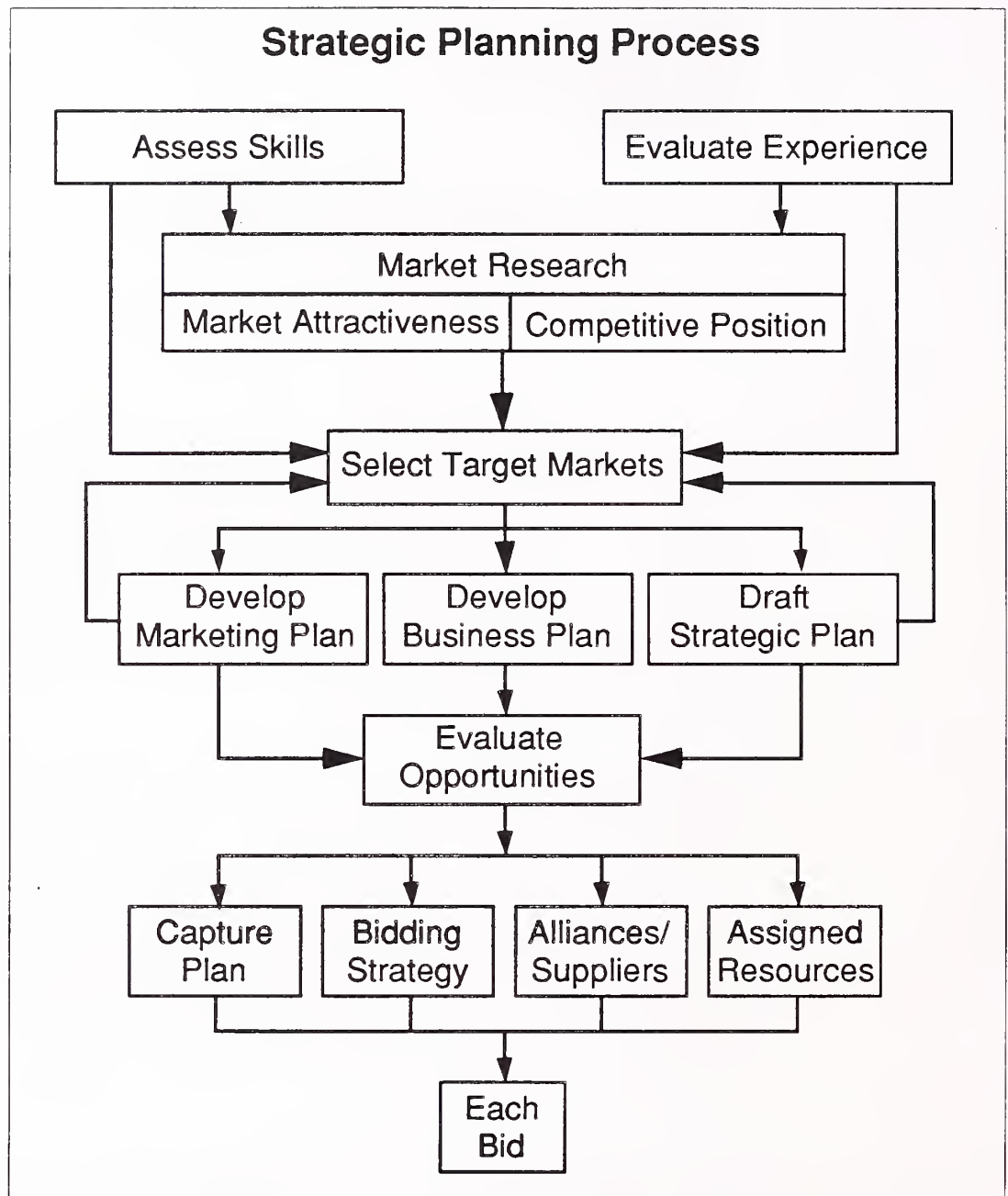
A

Market and Opportunity Identification

Systems integration vendors do not publicly divulge their strategies, their targeted opportunities, or many of their internal bidding procedures. Nor do they explain the tactical plans and final winning steps as they obtain highly desirable commercial and federal SI contracts.

Elements of the processes SI vendors employ eventually become apparent, through post-award announcements, market analysis, press coverage, professional lectures, and competitor comments. The process outlined in Exhibit V-1 is an amalgamation of the same methodology used in other highly competitive businesses. The key step, however, is development of strategic plans and selection of strategic goals after careful assessment of internal resources and comparison with the requirements of desirable industry-specific, cross-industry, or some suitable combination of markets.

EXHIBIT V-1



An important aspect of the SI process is that it is continuous. Results of later steps are fed back for fine tuning and course corrections when needed. Less time is consumed in selecting the markets if the in-house resource assessment is done first.

A market or submarket should be selected that demonstrates the prospects for a series of bids that can leverage earlier successes. Both market attractions and competitive position need to be assessed. At first, the selection should be fairly narrow, with one or two alternates that could be followed if the prime selection doesn't produce contracts.

Over the past several years, many midsize and large vendors took stock of their diversification and elected to close departments and divisions that were unsuccessful in marketing. Most competitors admitted that resources were diffused by too many parallel demands and too few real opportunities. In addition, their centralized resources were less responsive to customers who requested services.

Opportunities that do not fit within the limits of the tactical business plan or do not focus on the longer term strategic goal(s) must be discarded before any serious resource commitments take place.

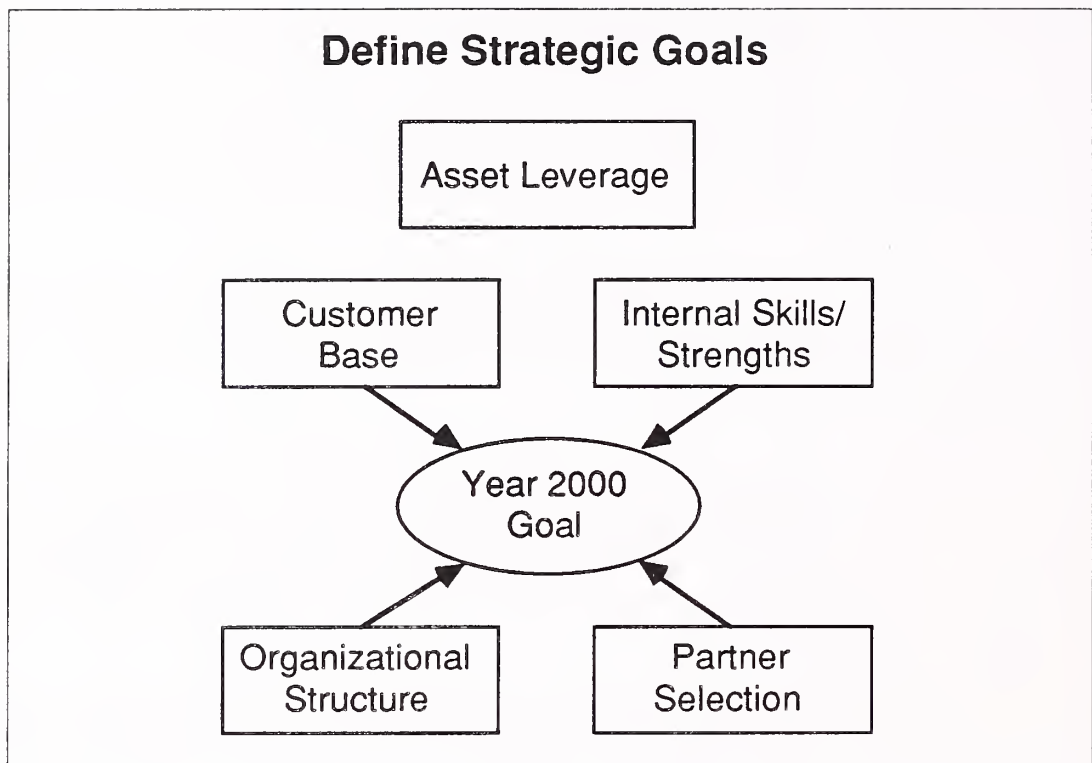
The capture plan must consider the client's stated and presumed objectives, the probable strategy of the leading competitor(s), and presale activities to improve image and select partners/allies. The bidding strategy must consider resource commitment, proposal development, key selling points, real cost and potential cost exposures, risk, and the negotiable price range.

Every SI company must realistically assess its ability to perform on an individual contract. While this is a function of each company's distinctive competencies, it is also dependent on the specific technology, opportunities, the industry, and the client. It is critical to know which SI programs not to pursue.

Reference should be made to Chapter III, Market Analysis and Forecast, and Chapter IV, Vertical Industry Markets for Systems Integration, for preliminary guidance on market growth potential, key opportunity areas, and industry-unique hurdles.

Early in the process, the SI vendor/candidate needs to define the company's strategic goal(s). The goals need to be realistic, clearly and definitively stated in writing, and communicated to the whole organization. Painstaking care should be taken to avoid frequent restatement, which can lead to confusion. The key elements are identified in Exhibit V-2.

EXHIBIT V-2



Partner selection and alliances will be discussed later, but an accurate assessment must first be made of internal skills, strengths, and weaknesses—as mapped against the capabilities required to attain the long-range goal. The specific type and quality of required external resources can be determined by examining the vendor's existing client base and projecting the number of clients that will require integration services.

B

Marketing and Sales

In the early stages of SI market development, the degree to which vendors were able to leverage their marketing strengths to focus on the target markets determined who obtained the early lead. Although IBM, EDS, CSC, and Andersen Consulting have corporate policies limiting them from disclosing details of their businesses, it was and is their practice—and that of every vendor—to leverage early contract successes to give them a high degree of visibility. Exhibit V-3 summarizes key common elements to the success of these industry participants.

EXHIBIT V-3

Marketing Is Key

- IBM, CSC, EDS, and Andersen Consulting show
 - Marketing/sales strength
 - Industry focus leadership
 - Early success in the market
 - Early alliance formations
 - Executive management commitment

Market positioning, or the ability to occupy a specific segment and fulfill a specific role in the market, is not only dependent on a vendor's natural skill base. It is also a question of posturing or seizing the high ground in a given market area and holding it.

Technical positioning is a different matter altogether, as outlined in Exhibit V-4. Here a vendor must compare its abilities with respect to the target market(s) in terms of industry processes—e.g., shop floor operations in manufacturing—and typical hardware and systems software environments found—e.g., DEC/VMS, IBM/VM/MVS—in addition to the applications requirements of the individual companies.

The vendor must also carefully evaluate the strengths and weakness of the competition and their probable ranking in contract award process. Unless vendors are sure to be considered at least in the top three competitors, they would be well advised to discontinue, before investing precious money in a no-win situation.

EXHIBIT V-4

Market Analysis

- Examine target market potential
 - Ability to fund
 - State of user sophistication
 - Number of SI projects in next five years
- Vendor image in market
- Competitor market penetration

An appraisal must be made of the company's knowledge of the industry processes and applications found in the target market, particularly vertical market processes. These are the foundation of the vendor's ability to counsel users on CSI implementations. Although it is possible to participate in systems integration projects that do no more than update the technical solutions to an existing process, the future belongs to vendors that are able to innovate at the industry process level.

Presale efforts should also be carefully planned to maximize use of early marketing information. They should also contribute effectively to the vendor's overall understanding of the market, the opportunities, and the key prospective clients. Sales staff need to identify the key players in the client decision chain and to develop a sense of the typical program values that win in the market.

C

Bid/Proposal Preparation

The bid/proposal preparation process begins with some indication that a prospective client intends to award a contract for implementation of a system. In the federal market the intention can be included in a briefing to industry or notice of "sources sought" in the *Commerce Business Daily*, published by the Commerce Department. Most commercial market leads begin with an informal inquiry, but some—primarily state and local government, medical, and education industry—prospects advertise their intention of issuing a letter of solicitation.

In all but a few special areas, governments use well-defined SI functional or system performance specifications and frequently ask for industry comments on the proposed procurement. The procurement process is not as well structured in the current commercial SI sector, and often does not include a formal request for proposal (RFP), project specifications, and stated bid evaluation criteria.

At the very least, vendors should develop a detailed checklist of generic tasks associated with an SI program. This checklist can be used in early conversations with the client to discuss what the program entails and whether the integrator or the IS staff is to take responsibility for each individual task.

In the absence of formal statements, a strategic decision needs to be made by the CSI bidder to establish congruence between what the client wants, needs, and can afford. To avoid potential pitfalls, CSI vendors may prefer to propose feasibility studies as a first step in a major project. This early participation in a consultative role has the additional advantage of establishing a level of comfort between contractor and client that may pay off in managing the program later. This strategy can backfire, however, if the

competition can convince the client that this step is unnecessary and a waste of time and resources.

Many CSI engagements start with a business process re-engineering study. This consulting engagement identifies how more efficient business processes can be employed often with new technologies. The results of this phase are often used to evaluate and justify the complete SI program.

Considering the performance of tasks outlined in Exhibit V-5, the investment required of vendors in developing a bid is substantial, frequently 5% to 6% of the contract value. Significant amounts of time and money must be spent in understanding the functional requirements, technical specifications, time and financial constraints, business terms and conditions, other salient factors (internal politics, key decision makers, buyer perceptions), and the selection process and evaluation criteria to be used in the process.

Once these specifics are understood, additional time and money must be expended on developing the bid. An assessment of in-house capabilities must be made with respect to the requirements. What does the bidder bring to the project? Internal skills must be identified and a determination made of what additional skills need to be acquired.

Partnerships and alliances should be developed as early in the bidding process as possible, even before the formal process begins. Strong alliances can help to construct a winning bid by highlighting experiences and discussing features beneficial to the client. The field sales and middle management personnel of allies and subcontractors can function as additional intelligence gatherers about the competition.

EXHIBIT V-5

Bid Development and Investment

- Requirement analysis
 - Wants versus needs
 - Functional solution
 - Feasibility
- Proposal basis
 - System architecture
 - Equipment and software
 - Delivery requirements
 - Acceptance criteria
- Staffing
 - Project management
 - In-house staff
 - Outside skills needed
- Environment
 - Installation
 - Training
- Costing
 - Labor
 - Materials
 - Markup
- Competitive analysis
- Competitive pricing

There is, and should be, a sense of uneasiness about alliances in many SI vendors, particularly those that would prefer arm's-length subcontract relations with suppliers. There have been several excellent publications on this subject from the graduate business schools of MIT, Harvard, and UCLA. The essence of the UCLA study is noted briefly in Exhibit V-6 and also discussed in Chapter III.

EXHIBIT V-6

Problems of Vendor Alliances

- Problems
 - Impact of environmental forces
 - Short-term differences in performance
 - Perceived versus actual benefits
 - Unwillingness to share key assets
 - Differences in business culture
- Steps to minimize failures
 - Clearly determine common objectives
 - Communicate strategy to operating people
 - Avoid complexity
 - Insulate alliances from partners

The problems that contribute to the failure of alliances can occur quickly if adequate planning and execution of the agreement do not occur. Benefits and key asset sharing are quoted most frequently. Differences in business culture may take some time to become fatal. One approach is to apply the same process to managing subcontractors as is used on the program itself. Be alert for communication breakdowns. They are often a leading indicator of trouble.

Because of these potential problems, the need for early involvement, and the speed with which opportunities arise, many vendors have established alliance agreements that cover future contracting opportunities. These agreements detail how the two parties will work together when an opportunity does arise. Basic terms and conditions are defined and agreed upon so that when an opportunity arises the alliance can be engaged immediately.

Once an alliance is engaged, the avoidance steps can prevent the type of distrust that may cause failure to achieve a winning combination. Clearly written objectives in the hands of key managers and open communication appear to be the most effective tools. But alliances are rarely intended to last long.

Some potential projects will be so technically advanced as to invite the question, "Can it be done?" For these projects an investment in engineering a prototype may be required. If the prototyping requirement is expensive, the buyer may be willing to underwrite the cost, unless the buyer believes the prototype could be used by others.

The bidder should also invest in competitive analysis. Much more than listing the strengths and weaknesses of the competition, this assessment requires the development of an "as if" bid. In this method the bidder's staff actually develops the bid that they think the competitor might submit. The bidder's actual bid must beat this "straw man" bid in the internal review before being submitted to the buyer. When the size of the award dictates, the internal effort applied to the development of these two bids can result in a very strong and, hopefully, winning bid.

D

Program and User Management

Program management requirements have been emphasized throughout this report. Skill in these associated tasks is critical to managing/containing risks, and vendors need to have a deep understanding of theory and techniques, and strong supportive tools.

One aspect of program management frequently overlooked by contractors is the need to vest contract authority in the program manager. In time-critical projects, layered management can impede the schedule and add unnecessary risks. The results of assigning responsibility to a single manager who can act quickly far outweigh the risks of program delays and cost overruns. This is one of the main reasons why major vendors have been moving implementation resources closer to the customer.

Another aspect of management frequently neglected in SI-type programs is the need to manage the user. The contractor does not want to be second-guessed on every decision. The user must be kept informed of impending decisions, and when decisions are made, the user must be informed of the decision and convinced that the decision was the alternative that best met the user's interests. More clients are providing their own program manager to manage the internal aspects of the SI engagement. The client also must develop the proper receptor organization to accept the completed system.

A formal change management system is also strongly recommended. User requests for changes to specifications and vendor approvals should be in writing and include projected impact on project schedule and cost.

User management also entails avoiding surprises. Formal and informal status reports must be made to various levels of the client organization on

a timely basis, to assure ultimate acceptance. Problems will always occur in a major SI engagement. The true test of an SI vendor is how such problems are handled. One major element is rapid and accurate communication.

E

Risk Containment

In federal projects, government regulations guide the extent to which the agency client shares the performance and cost risk with the SI vendor. In the commercial sector, the primary responsibility is assigned to the CSI prime contractor. This assignment does not mean that the contractor must take sole responsibility. It is possible to share the risks with partners, allies, and third-party suppliers. Subcontracts must contain the provisions, and the suppliers need to be made a part of the overall program team. Keys to managing risk containment are listed in Exhibit V-7.

EXHIBIT V-7

Risk Containment

- Risk level assessed during bid preparation
- Risk varies with project size, complexity, client sensitivity
- Risk shared with subcontractors
- Sensitize all levels of company to risk management
- Liability insurance coverage

It is essential that all levels of the vendor's organization be made aware and sensitive to the needs and procedures of risk management. Areas of potential risk should be identified during the bid preparation phase and the probable extent of exposure estimated.

It is also prudent for CSI vendors to provide for potential legal and financial liabilities by acquiring liability insurance coverage and making the necessary changes to cover the unique risks of CSI, including third-party failures and dissatisfaction of the client on delivery.

F

Bid Selection and User Purchase Criteria

Beyond technical content, the SI vendor's bid must also reflect congruence between the buyer's perception of his own strengths and weaknesses and the capabilities of the bidder. The bid should leave the buyer with the feeling that the bidder recognizes the client's capabilities and has plans for covering the weaknesses.

Individual client organizations differ with respect to the extent that the vendor analysis of strengths and weaknesses affects the valuation given the bidder. The impact potential is largely influenced by the client's IS staff's knowledge of the industry and the applications.

Unless the bid solicitation dictates otherwise, the bid should exclude services that the vendor might like to provide but would have a low priority for the client. System maintenance, maintenance of a network, and maintenance of the total system are three examples.

The type of contract proposed by the bidder makes a strong statement of the bidder's concern about the risks involved and the bidder's confidence in managing and containing this risk. A fixed-price contract with performance guarantees and even strong penalty clauses tells the buyer of the bidder's confidence in successfully completing the project to the buyer's satisfaction. Most vendors have avoided fixed-price contracts in the past, preferring the safety of a time-and-materials contract. This is changing and forcing vendors to assume more of the risk.

Fixed-price contracts with performance guarantees are currently much more acceptable to clients than other types of business terms, including fixed-price without guarantees. The performance guarantee requirement is a risk trade-off from the client's perspective. With diminished control over the developing system, users seek maximum assurance through guarantees. In many situations this guarantee becomes mandatory.

Another area of risk to the vendor is the terms and conditions of acceptance criteria. Demonstration and acceptance can either be proposed in the bid or become part of the final contract negotiation. Provision of the acceptance procedure in the bid could help the user feel more confident about the bidding vendor. Detailing the acceptance procedure draws a clean line showing when the system is complete. This is critical to qualify for final payment and to define what is under the original contract and what is follow-on or enhancement work.

G**Recommendations**

Suggestions for getting started or improving probabilities of success have been included in Chapter III and throughout this chapter. The key points that have been made are listed in Exhibit V-8.

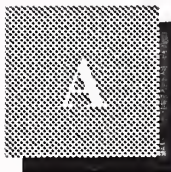
EXHIBIT V-8

Recommendations

- Select markets and target programs carefully
- Market expertise in application areas
- Demonstrate knowledge of technology
- Establish strong alliance programs
- Employ risk management policies
- Demonstrate risk acceptance
- Procedurize bid preparation
- Demonstrate program management skills

- Select markets and target programs that are, or can become, a natural fit for the company's skills, experience, and resources. Bring in allies or subcontractors to fill the voids.
- Market company expertise in key industries and applications to build an image with potential clients and attract valuable third-party assistance.
- Demonstrate expertise in current and new technology that has direct applicability to the targeted industry markets.
- Establish strong alliance programs that can help overpower the competition—but make the alliance part of the company team—to offer a united front to the client. Establish a corporate program to develop and manage alliances.
- Employ risk management assessment and containment policies and advertise the availability of these skills in the company.
- Accepting risk is an essential element of an SI engagement. Balance risk and acceptance against confidence in the ability to effectively perform.

- Use disciplined bid preparation procedures with administrative control, graphics document handling, and cost-accounting techniques.
- Demonstrate program management and user management skills with formal policies and vested authority to control the program and interface with client management directly.



Definition of Terms

A

Introduction

INPUT's *Definition of Terms* provides the framework for all of INPUT's market analyses and forecasts of the information services industry. It is used for all U.S. programs. The structure defined in Exhibit A-1 is also used in Europe and for the worldwide forecast.

One of the strengths of INPUT's market analysis services is the consistency of the underlying market sizing and forecast data. Each year INPUT reviews its industry structure and makes changes if they are required. When changes are made they are carefully documented and the new definitions and forecasts reconciled to the prior definitions and forecasts. INPUT clients have the benefit of being able to track market forecast data from year to year against a proven and consistent foundation of definitions.

For 1992 INPUT has added one delivery mode and defined three new submodes to its Information Services Industry Structure:

- *Equipment Services* has been added as the ninth delivery mode. INPUT has forecasted the equipment maintenance, support and related services market through its Customer Services Programs for a number of years. Starting in 1992, the equipment services portion of the customer services market will be included in the total information services industry as defined by INPUT. Other portions of this market (such as software support) are already included.
- Two new submodes have been defined in the *Systems Operations* delivery mode - *desktop services* and *network management*. They are defined on pages 5 and 6.
- A fourth submode has been defined within the Professional Services delivery mode—*applications management*. This change reflects a shift in the way some software development and maintenance services are purchased. A complete definition is provided on page 6.

A series of definitions for computer equipment have also been added.

Changes from the 1991 INPUT *Definitions of Terms* are indicated with a ☆.

B

Overall Definitions and Analytical Framework

1. Information Services

Information Services are computer/telecommunications-related products and services that are oriented toward the development or use of information systems. Information services typically involve one or more of the following:

- Use of vendor-provided computer processing services to develop or run applications or provide services such as disaster recovery or data entry (called *Processing Services*)
- A combination of computer equipment, packaged software and associated support services which will meet an application systems need (called *Turnkey Systems*)
- Packaged software products, including systems software or applications software products (called *Software Products*)
- People services that support users in developing and operating their own information systems (called *Professional Services*)
- The combination of products (software and equipment) and services where the vendor assumes total responsibility for the development of a custom integrated solution to an information systems need (called *Systems Integration*)
- Services that provide operation and management of all or a significant part of a user's information systems functions under a long-term contract (called *Systems Operations*)
- Services that support the delivery of information in electronic form—typically network-oriented services such as value-added networks, electronic mail and document interchange (called *Network Applications*)
- Services that support the access and use of public and proprietary information such as on-line data bases and news services (called *Electronic Information Services*)
- Services that support the operation of computer and digital communication equipment (called *Equipment Services*)

In general, the market for information services does not involve providing equipment to users. The exception is where the equipment is part of an overall service offering such as a turnkey system, a systems operations contract, or a systems integration project.

The information services market also excludes pure data transport services (i.e., data or voice communications circuits). However, where information transport is associated with a network-based service (e.g., electronic data interchange services), or cannot be feasibly separated from other bundled services (e.g., some systems operations contracts), the transport costs are included as part of the services market.

The analytical framework of the information services industry consists of the following interacting factors: overall and industry-specific business environment (trends, events and issues); technology environment; user information system requirements; size and structure of information services markets; vendors and their products, services and revenues; distribution channels; and competitive issues.

2. Market Forecasts/User Expenditures

All information services market forecasts are estimates of *User Expenditures* for information services. When questions arise about the proper place to count these expenditures, INPUT addresses them from the user's viewpoint: expenditures are categorized according to what users perceive they are buying.

By focusing on user expenditures, INPUT avoids two problems which are related to the distribution channels for various categories of services:

- Double counting, which can occur by estimating total vendor revenues when there is significant reselling within the industry (e.g., software sales to turnkey vendors for repackaging and resale to end users)
- Missed counting, which can occur when sales to end users go through indirect channels such as mail order retailers

Captive Information Services User Expenditures are expenditures for products and services provided by a vendor that is part of the same parent corporation as the user. These expenditures are not included in INPUT forecasts.

Non-captive Information Services User Expenditures are expenditures that go to vendors that have a different parent corporation than the user. It is these expenditures which constitute the information services market analyzed by INPUT and that are included in INPUT forecasts.

3. Delivery Modes

Delivery Modes are defined as specific products and services that satisfy a given user need. While *Market Sectors* specify *who* the buyer is, *Delivery Modes* specify *what* the user is buying.

Of the nine delivery modes defined by INPUT, six are considered primary products or services:

- *Processing Services*
- *Network Services*
- *Professional Services*
- *Applications Software Products*
- *Systems Software Products*
- *Equipment Services*

The remaining three delivery modes represent combinations of these products and services, combined with equipment, management and/or other services:

- *Turnkey Systems*
- *Systems Operations*
- *Systems Integration*

Section C describes the delivery modes and their structure in more detail.

4. Market Sectors

Market Sectors or markets are groupings or categories of the buyers of information services. There are three types of user markets:

- *Vertical Industry* markets, such as Banking, Transportation, Utilities, etc. These are called “industry-specific” markets.
- *Functional Application* markets, such as Human Resources, Accounting, etc. These are called “cross-industry” markets.
- *Other* markets, which are neither industry- nor application-specific, such as the market for systems software products and much of the on-line data base market.

Specific market sectors used by INPUT are defined in Section E, below.

5. Trading Communities

Information technology is playing a major role in re-engineering, not just companies but the value chain or *Trading Communities* in which these companies operate. This re-engineering is resulting in electronic commerce emerging where interorganizational electronic systems facilitate the business processes of the trading community.

- A trading community is the group or organizations—commercial and non-commercial—involved in producing a good or services.
- Electronic commerce and trading communities are addressed in INPUT's EDI and Electronic Commerce Program.

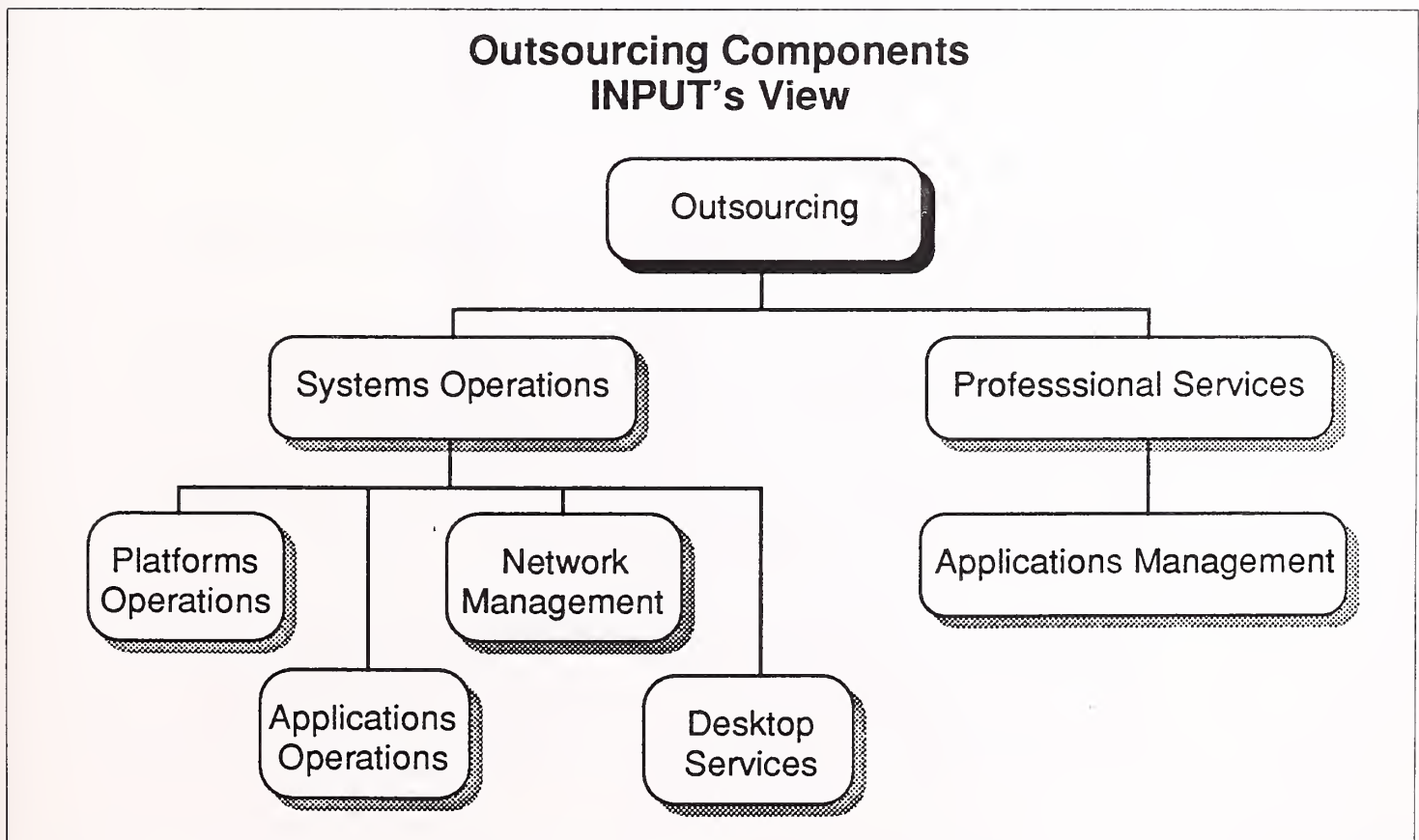
6. Outsourcing

Over the past few years a major change has occurred in the way clients are buying some information services. The shift has been labeled *outsourcing*.

INPUT views outsourcing as a change in the form of the client/vendor relationship. Under an outsourcing relationship, all or a major portion of the information systems function is contracted to a vendor in a long-term relationship. The vendor is responsible for the performance of the function.

INPUT considers the following submodes to be outsourcing-type relationships and in aggregate to represent the outsourcing market. See Exhibit A-1. Complete definitions are provided in Section C of this document. INPUT provides these forecasts as part of the corresponding delivery modes.

EXHIBIT A-1



- *Platform Systems Operations* - The vendor is responsible for managing and operating the client's computer systems.
- *Applications System Operations* - The vendor is responsible for developing and/or maintaining a client's applications as well as operating the computer systems.
- ☆ *Network Management* - The vendor assumes full responsibility for operating and managing the client's data communications systems. This may also include the voice communications of the client.
- ☆ *Applications Management/Maintenance* - The professional services vendor has full responsibility for developing and/or maintaining some or all of the applications systems that a client uses to support business operations. The services are provided on a long-term contractual basis.
- ☆ *Desktop Services* - The vendor assumes responsibility for the deployment, maintenance, and connectivity between the personal computers and/or intelligent workstations in the client organization. The services may also include performing the help-desk function. The services are provided on a long-term contractual basis.

C

Delivery Modes and Submodes

Exhibit A-2 provides the overall structure of the information services industry as defined and used by INPUT. This section of *Definition of Terms* provides definitions for each of the delivery modes and their submodes or components.

1. Software Products

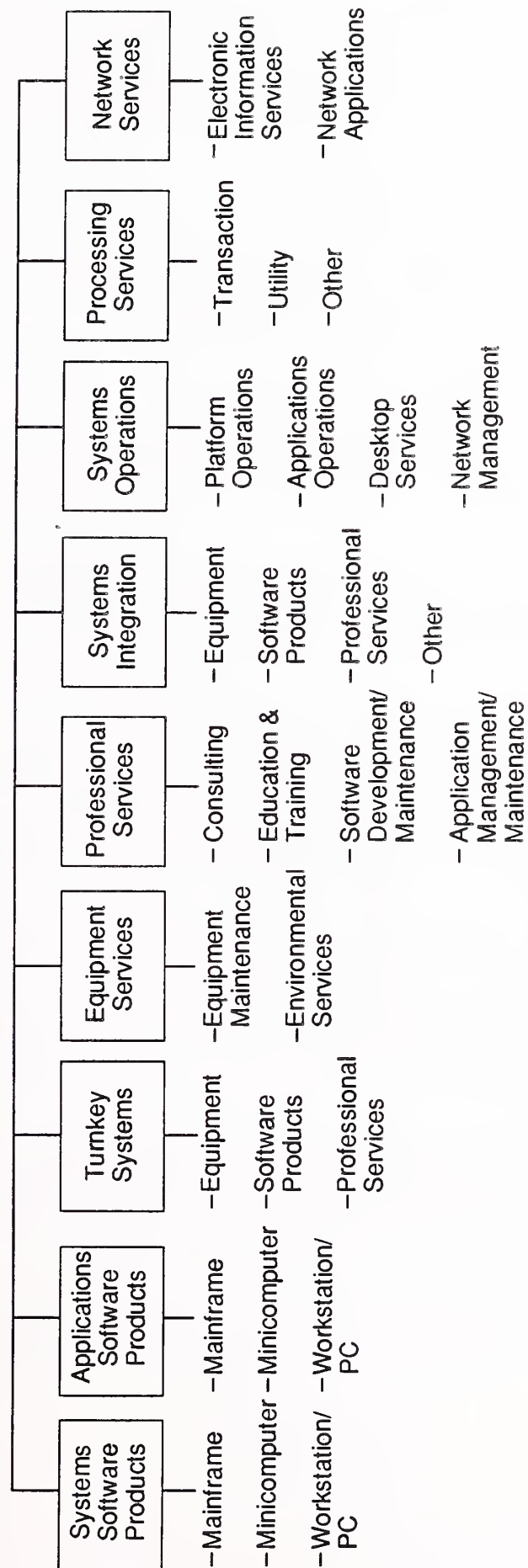
INPUT divides the software products market into two delivery modes: systems software and applications software.

The two delivery modes have many similarities. Both involve purchases of software packages for in-house computer systems. Included are both lease and purchase expenditures, as well as expenditures for work performed by the vendor to implement or maintain the package at the user's sites. Vendor-provided training or support in operation and use of the package, if part of the software pricing, is also included here.

Expenditures for work performed by organizations other than the package vendor are counted in the professional services delivery mode. Fees for work related to education, consulting, and/or custom modification of software products are also counted as professional services, provided such fees are charged separately from the price of the software product itself.

EXHIBIT A-2

Information Services Industry Structure—1992

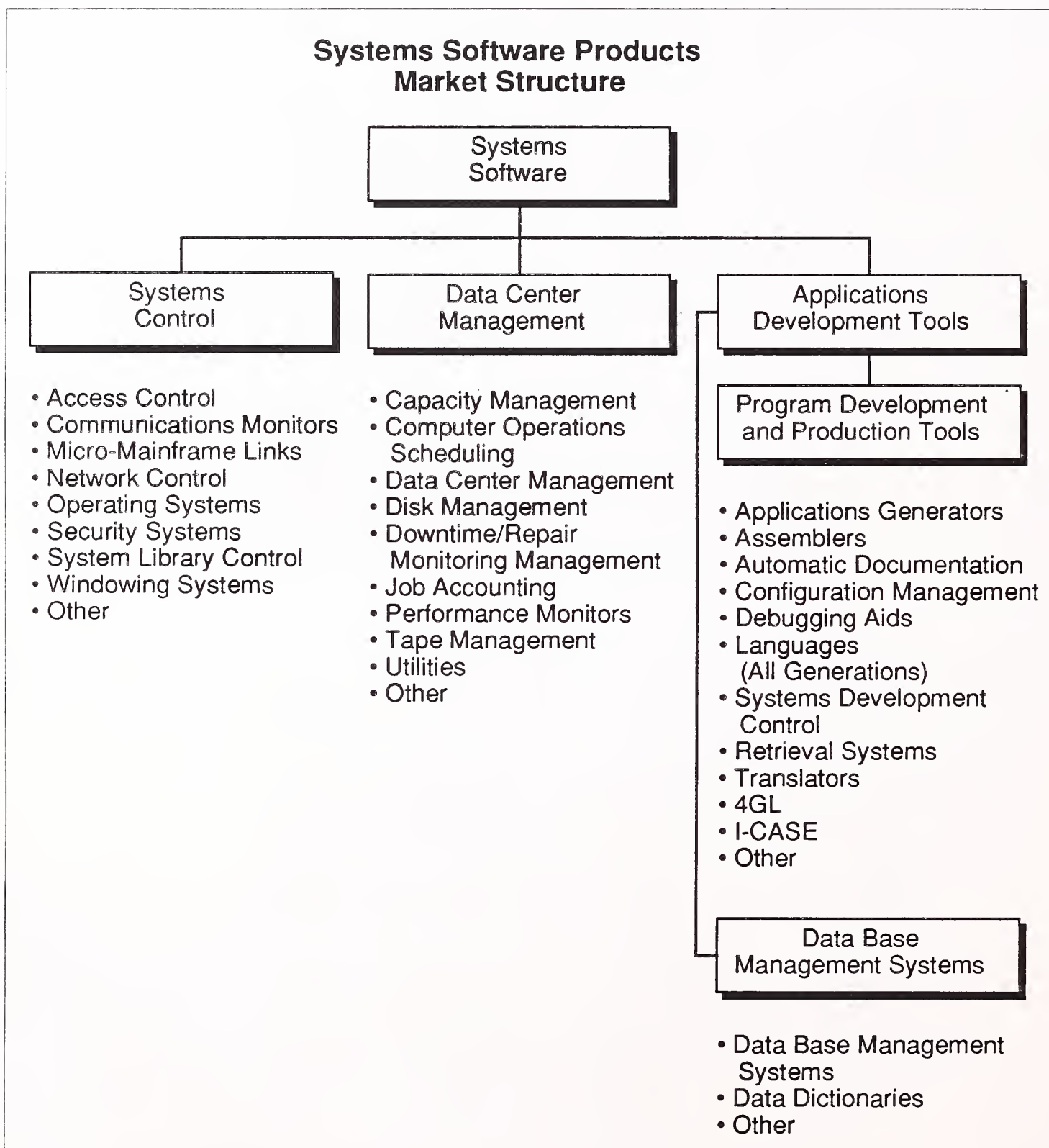


Source: INPUT

a. Systems Software Products

Systems software products enable the computer/communications system to perform basic machine-oriented or user interface functions. INPUT divides systems software products into three submodes. See Exhibit A-3.

EXHIBIT A-3



- *Systems Control Products* - Software programs that manage computer system resources and control the execution of programs. These products include operating systems, emulators, network control, library control, windowing, access control, and spoolers.
- *Operations Management Tools* - Software programs used by operations personnel to manage the computer system and/or network resources and personnel more effectively. Included are performance measurement, job accounting, computer operation scheduling, disk management utilities, and capacity management.
- *Applications Development Tools* - Software programs used to prepare applications for execution by assisting in designing, programming, testing, and related functions. Included are traditional programming languages, 4GLs, data dictionaries, data base management systems, report writers, project control systems, CASE systems and other development productivity aids.

INPUT also forecasts the systems software products delivery mode by platform level: mainframe, minicomputer and workstation/PC.

b. Applications Software Products

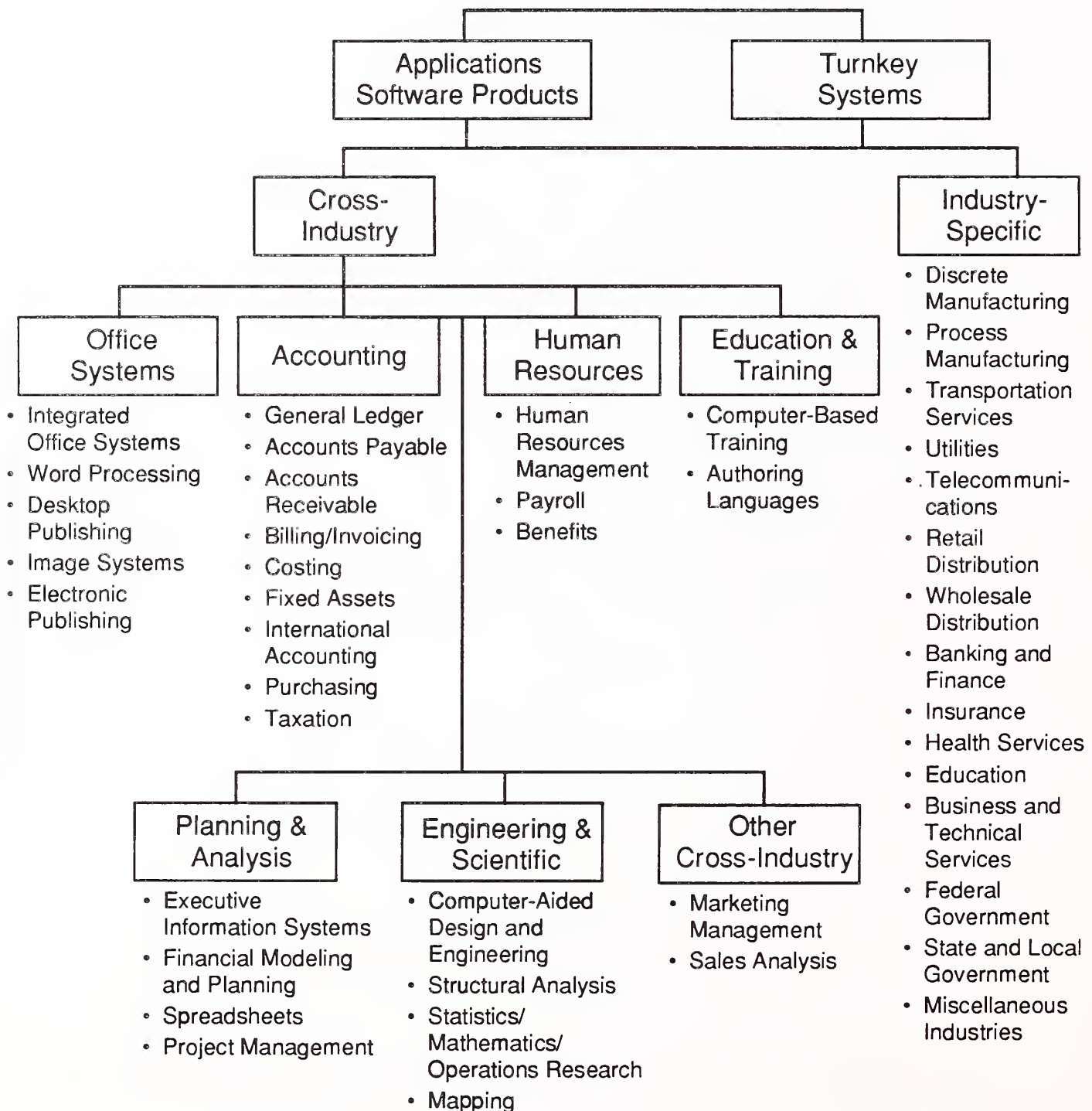
Applications software products enable a user or group of users to support an operational or administrative process within an organization. Examples include accounts payable, order entry, project management and office systems. INPUT categorizes applications software products into two groups of market sectors. (See Exhibit A-4.)

- *Industry Applications Software Products* - Software products that perform functions related to fulfilling business or organizational needs unique to a specific industry (vertical) market and sold to that market only. Examples include demand deposit accounting, MRPII, medical record keeping, automobile dealer parts inventory, etc.
- *Cross-Industry Applications Software Products* - Software products that perform a specific function that is applicable to a wide range of industry sectors. Examples include payroll and human resource systems, accounting systems, word processing and graphics systems, spreadsheets, etc.

INPUT also forecasts the applications software products delivery mode by platform level: mainframe, minicomputer and workstation/PC.

EXHIBIT A-4

Application Products and Turnkey Systems



2. Turnkey Systems

A turnkey system is an integration of equipment (CPU, peripherals, etc.), systems software, and packaged applications software into a single product developed to meet a specific set of user requirements. Value added by the turnkey system vendor is primarily in the software and professional services provided. INPUT categorizes turnkey systems into two groups of market sectors as it does for applications software products. (See Exhibit A-4.)

Most CAD/CAM systems and many small business systems are turnkey systems. Turnkey systems utilize standard computers and do not include specialized hardware such as word processors, cash registers, process control systems, or embedded computer systems for military applications.

Computer manufacturers (e.g., IBM or DEC) that combine software with their own general-purpose hardware are not classified by INPUT as turnkey vendors. Their software revenues are included in the appropriate software category.

Most turnkey systems are sold through channels known as value-added resellers.

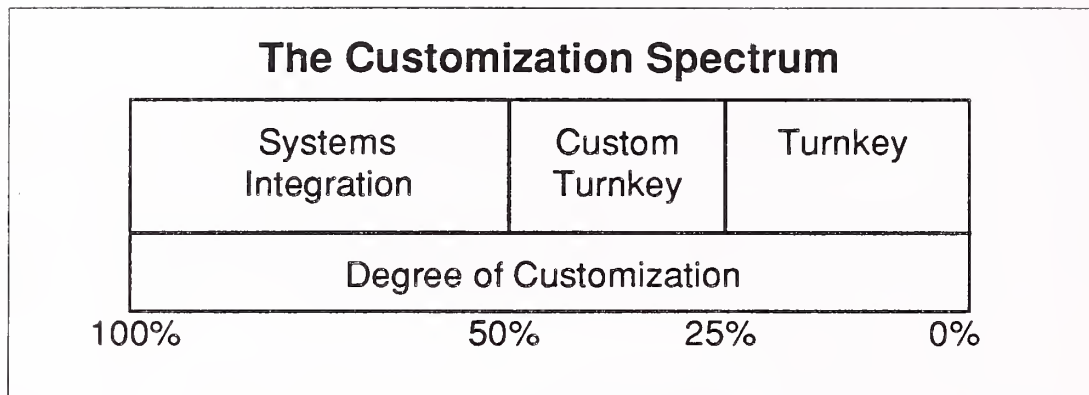
- *Value-Added Reseller (VAR)*: A VAR adds value to computer hardware and/or software and then resells it to an end user. The major value added is usually applications software for a vertical or cross-industry market, but also includes many of the other components of a turnkey systems solution, such as professional services, software support, and applications upgrades.

Turnkey systems have three components:

- Equipment - computer hardware supplied as part of the turnkey system
- Software products - prepackaged systems and applications software products
- Professional services - services to install or customize the system or train the user, provided as part of the turnkey system sale

Exhibit A-5 contrasts turnkey systems with systems integration. Turnkey systems are based on available software products that a vendor may modify to a modest degree.

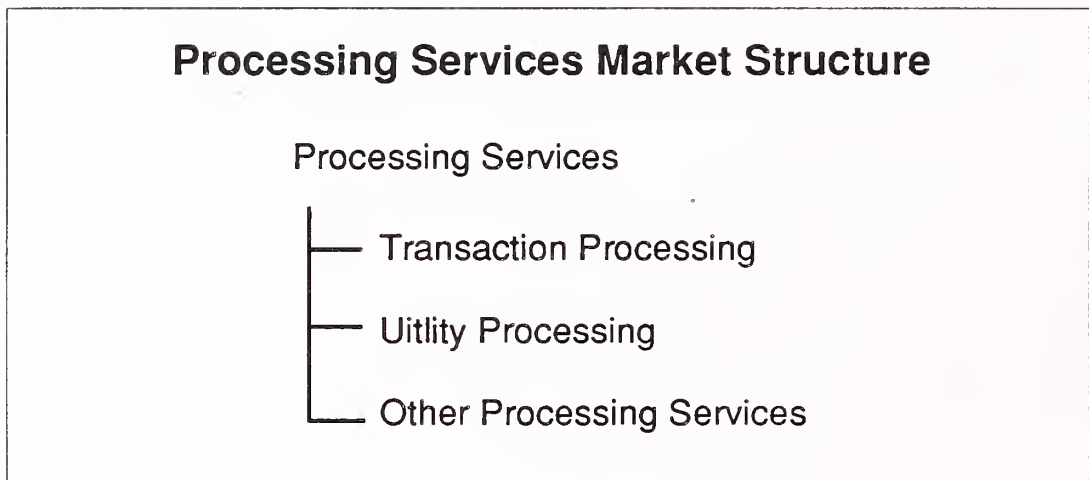
EXHIBIT A-5



3. Processing Services

This delivery mode includes three submodes: transaction processing, utility processing, and “other” processing services. See Exhibit A-6.

EXHIBIT A-6



- *Transaction Processing* - Client uses vendor-provided information systems—including hardware, software and/or data networks—at the vendor site or customer site to process specific applications and update client data bases. The application software is typically provided by the vendor.
- *Utility Processing* - Vendor provides basic software tools (language compilers, assemblers, DBMSs, graphics packages, mathematical models, scientific library routines, etc.), enabling clients to develop and/or operate their own programs or process data on the vendor's system.
- *Other Processing Services* - Vendor provides service—usually at the vendor site—such as scanning and other data entry services, laser printing, computer output microfilm (COM), CD preparation and other data output services, backup and disaster recovery, etc.

4. Systems Operations

Systems operations as a delivery mode was introduced in the 1990 Market Analysis and Systems Operations programs. Previously called Facilities Management, this delivery mode was created by taking the Systems Operations submode out of both Processing Services and Professional Services. For 1992 the submodes have been defined as follows.

Systems operations involves the operation and management of all or a significant part of the client's information systems functions under a long-term contract. These services can be provided in either of two distinct submodes where the difference is whether the support of applications, as well as data center operations, is included.

- *Platform systems operations* - The vendor manages and operates the computer systems, to perform the client's business functions, without taking responsibility for the client's application systems.
- *Applications systems operations* - The vendor manages and operates the computer systems to perform the client's business functions, and is also responsible for maintaining, or developing and maintaining, the client's application systems.
- ☆ *Network Management* - The vendor assumes responsibility for operating and managing the client's data communications systems. This may also include the voice communications of the client. A network management outsourcing contract may include only the management services or the full costs of the communications services and equipment plus the management services.
- ☆ *Desktop Services* - The vendor assumes responsibility for the deployment, maintenance, and connectivity among the personal computers and/or workstations in the client organization. The services may also include performing the help-desk function. Equipment as well as services can be part of a desktop services outsourcing contract.

Note: This type of client service can also be provided through traditional professional services where the contractual criteria of outsourcing are not present.

Systems operations vendors now provide a wide variety of services in support of existing information systems. The vendor can plan, control, provide, operate, maintain and manage any or all components of the client's information systems environment (equipment, networks, applications systems), either at the client's site or the vendor's site.

Note: In the federal government market, systems operation services are also defined by equipment ownership with the terms “COCO” (Contractor-Owned, Contractor-Operated), and “GOCO” (Government-Owned, Contractor-Operated).

5. Systems Integration (SI)

Systems integration is a vendor service that provides a complete solution to an information system, networking or automation development requirement through the custom selection and implementation of a variety of information system products and services. A systems integrator is responsible for the overall management of a systems integration contract and is the single point of contact and responsibility to the buyer for the delivery of the specified system function, on schedule and at the contracted price. (Refer to Exhibit A-7.)

The components of a systems integration project are the following:

- *Equipment* - information processing and communications equipment required to build the systems solution. This component may include custom as well as off-the-shelf equipment to meet the unique needs of the project. The systems integration equipment category excludes turnkey systems by definition.
- *Software products* - prepackaged applications and systems software products.
- *Professional services* - the value-added component that adapts the equipment and develops, assembles, or modifies the software and hardware to meet the system's requirements. It includes all of the professional services activities required to develop, implement, and if included in the contract, operate an information system, including consulting, program/project management, design and integration, software development, education and training, documentation, and systems operations and maintenance.
- *Other services* - most systems integration contracts include other services and product expenditures that are not classified elsewhere. This category includes miscellaneous items such as engineering services, automation equipment, computer supplies, business support services and supplies, and other items required for a smooth development effort.

EXHIBIT A-7

Products/Services in Systems Integration Projects

Equipment

- Information systems
- Communications

Software Products

- Systems software
- Applications software

Professional Services

- Consulting
 - Feasibility and trade-off studies
 - Selection of equipment, network and software
- Program/project management
- Design/integration
 - Systems design
 - Installation of equipment, network, and software
 - Demonstration and testing
- Software development
 - Modification of software packages
 - Modification of existing software
 - Custom development of software
- Education/training and documentation
- Systems operations/maintenance

Other Miscellaneous Products/Services

- Site preparation
- Data processing supplies
- Processing/network services
- Data/voice communication services

6. Professional Services

This category includes four submodes: consulting, education and training, software development, and applications management. Exhibit A-8 provides additional detail.

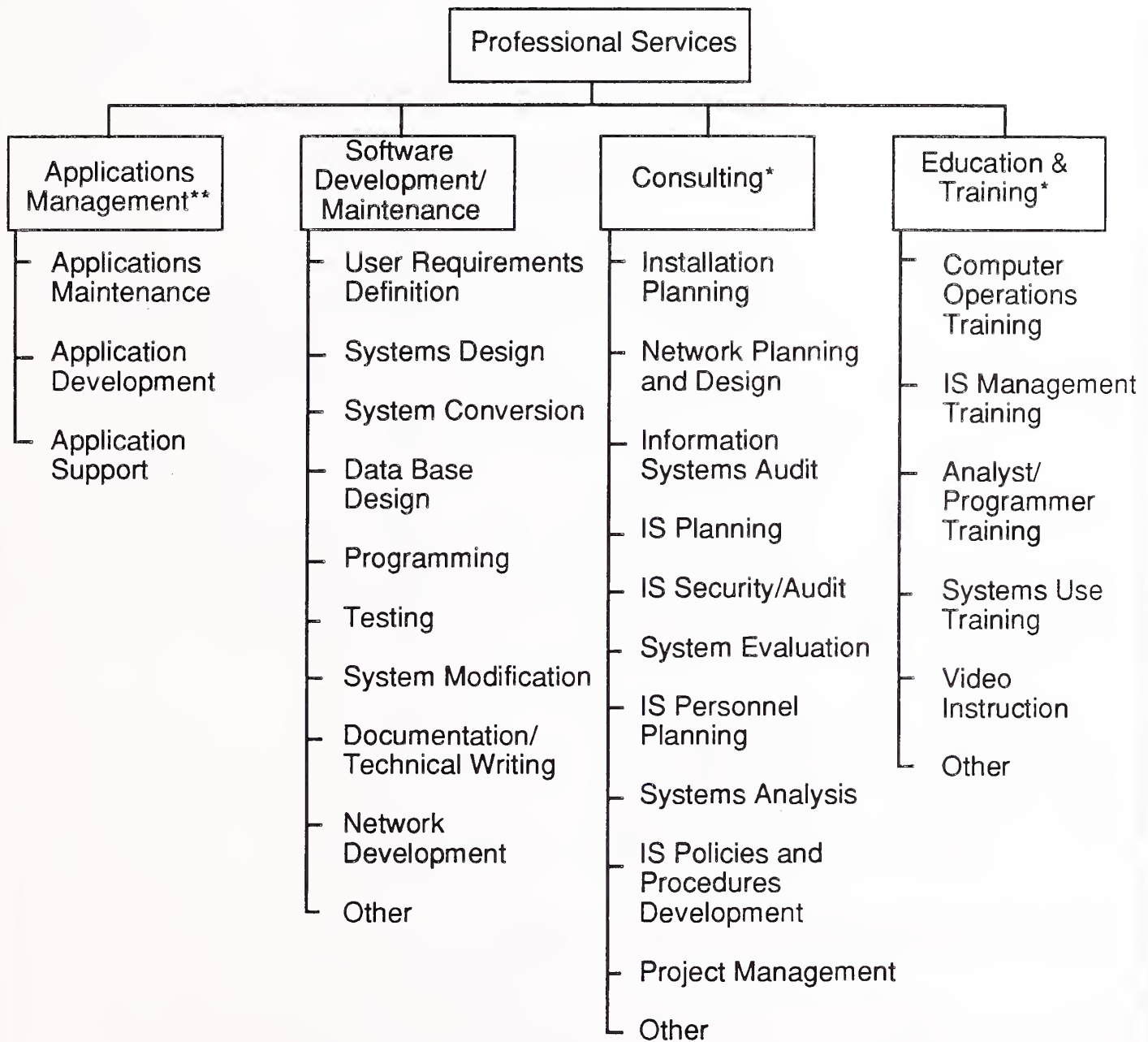
- *Consulting:* Services include management consulting (related to information systems), information systems re-engineering, information systems consulting, feasibility analysis and cost-effectiveness studies, and project management assistance. Services may be related to any aspect of the information system, including equipment, software, networks and systems operations.
- *Education and Training:* Services that provide training and education or the development of training materials related to information systems and services for the information systems professional and the user, including computer-aided instruction, computer-based education, and vendor instruction of user personnel in operations, design, programming, and documentation. Education and training provided by school systems are not included. General education and training products are included as a cross-industry market sector.
- *Software Development:* Services include user requirements definition, systems design, contract programming, documentation, and implementation of software performed on a custom basis. Conversion and maintenance services are also included.
- ☆ *Applications Management:* The vendor has full responsibility for maintaining and upgrading some or all of the application systems that a client uses to support business operations and may develop and implement new application systems for the client.

An applications management contract differs from traditional software development in the form of the client/vendor relationship. Under traditional software development services the relationship is project based. Under applications management it is time and function based.

These services may be provided in combination or separately from platform systems operations.

EXHIBIT A-8

Professional Services Market Structure



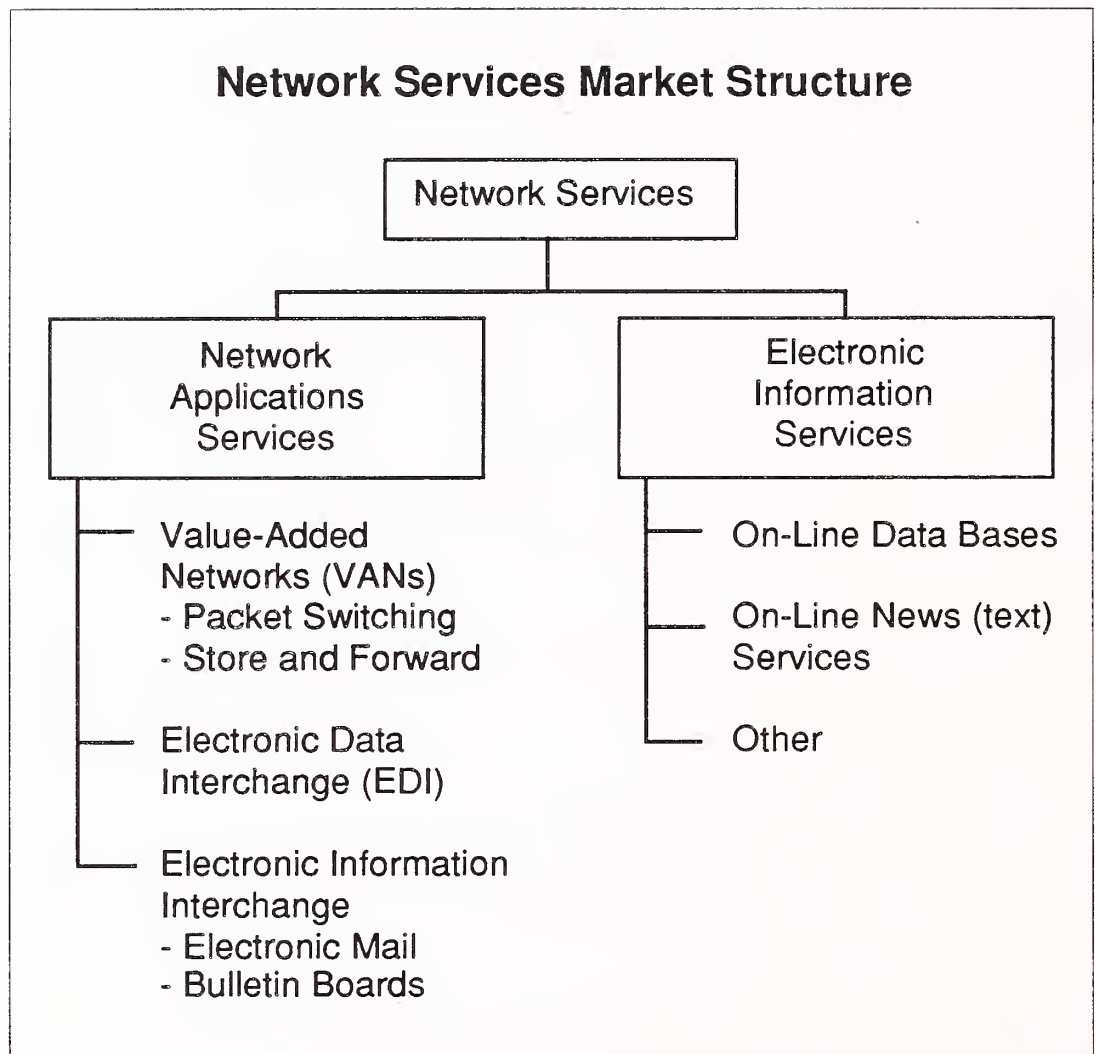
*Related to computer systems, topics, or issues

**Vendor assumes full responsibility on contracted longer term basis

7. Network Services

Network services are a variety of telecommunications-based functions and operations. Network service includes two submodes, as shown in Exhibit A-9.

EXHIBIT A-9



a. Electronic Information Services

Electronic information services are data bases that provide specific information via terminal- or computer-based inquiry, including items such as stock prices, legal precedents, economic indicators, periodical literature, medical diagnosis, airline schedules, automobile valuations, etc. The terminals used may be computers themselves, such as communications servers or personal computers.

Users inquire into and extract information from the data bases. They may load extracted data into their own computer systems; the vendor does not provide data processing or manipulation capability as part of the electronic information service and users cannot update the vendor's data bases. However, the vendor may offer other services (network applications or processing services) that do offer processing or manipulation capability.

The two kinds of electronic information services are:

- *On-line Data Bases* - Structured, primarily numerical data on economic and demographic trends, financial instruments, companies, products, materials, etc.
- Unstructured, primarily textual information on people, companies, events, etc. These are often news services.

While electronic information services have traditionally been delivered via networks, there is a growing trend toward the use of CD ROM optical disks to support or supplant on-line services, and these optical disk-based systems are included in the definition of this delivery mode.

b. Network Applications

Value-Added Network Services (VAN Services) - VAN services are enhanced transport services which involve adding such functions as automatic error detection and correction, protocol conversion, and store-and-forward message switching to the provision of basic network circuits.

While VAN services were originally provided only by specialized VAN carriers (Tymnet, Telenet, etc.), today these services are also offered by traditional common carriers (AT&T, Sprint, etc.). Meanwhile, the VAN carriers have also branched into the traditional common carriers' markets and are offering unenhanced basic network circuits as well.

Electronic Data Interchange (EDI) - Application-to-application electronic exchange of business data between trade partners or facilitators using a telecommunications network.

Electronic Information Interchange - The transmission of messages across an electronic network managed by a services vendor, including electronic mail, voice mail, voice messaging, and access to Telex, TWX, and other messaging services. This also includes bulletin board services.

8. Equipment Services

- ☆ The equipment services delivery mode includes two submodes. Both deal with the support and maintenance of computer equipment.
- ☆ *Equipment Maintenance* - Services provided to repair, diagnose problems and provide preventive maintenance both on-site and off-site for computer equipment. The costs of parts, media and other supplies are excluded. These services are typically provided on a contract basis.
- ☆ *Environmental Services* - Composed of equipment and data center related special services such as cabling, air conditioning and power supply, equipment relocation and similar services.

D

Computer Equipment

- ☆ These definitions have been included to provide the basis for market segmentation in the software products markets.
- ☆ *Computer Equipment* - Includes all computer and telecommunications equipment that can be separately acquired with or without installation by the vendor and not acquired as part of an integrated system. Unless otherwise noted in an INPUT forecast, computer equipment is only included where it is part of the purchase of services or software products (e.g., turnkey systems and systems integration).
- ☆ *Peripherals* - Includes all input, output, communications, and storage devices (other than main memory) that can be channel connected to a processor, and generally cannot be included in other categories such as terminals.
- ☆ *Input Devices* - Includes keyboards, numeric pads, card readers, light pens and track balls, tape readers, position and motion sensors, and analog-to-digital converters.
- ☆ *Output Devices* - Includes printers, CRTs, projection television screens, micrographics processors, digital graphics, and plotters
- ☆ *Communication Devices* - Includes modem, encryption equipment, special interfaces, and error control
- ☆ *Storage Devices* - Includes magnetic tape (reel, cartridge, and cassette), floppy and hard disks, solid state (integrated circuits), and bubble and optical memories

- ☆ *Computer Systems* - Includes all processors from personal computers to supercomputers. Computer systems may require type- or model-unique operating software to be functional, but this category excludes applications software and peripheral devices and processors or CPUs not provided as part of an integrated (turnkey) system.
- ☆ *Personal computers* - Smaller computers using 8-, 16-, or 32-bit computer technology. Generally designed to sit on a desktop and are portable for individual use. Price generally less than \$5,000.
- ☆ *Workstations* - High-performance, desktop, single-user computers often employing Reduced Instruction Set Computing (RISC). Workstations provide integrated, high-speed, local network-based services such as data base access, file storage and back-up, remote communications, and peripheral support. These products usually cost from \$5,000 to \$15,000.
- ☆ *Minicomputer or midsize computers* - Minicomputers are generally priced from \$15,000 to \$350,000. Many of the emerging client/server computers are in this category.
- ☆ *Mainframe or large computers* - Traditional mainframe and supercomputers costing more than \$350,000.

E

Sector Definitions

1. Industry Sector Definitions

INPUT structures the information services market into industry sectors such as process manufacturing, insurance, transportation, etc. The definitions of these sectors are based on the 1987 revision of the Standard Industrial Classification (SIC) code system. The specific industries (and their SIC codes) included under these industry sectors are detailed in Exhibit A-10.

INPUT includes all delivery modes except systems software products and equipment services in industry market sectors. See Exhibit A-9 and section E-3 (Delivery Mode Reporting by Sector).

Note: SIC code 88 is Personal Households. INPUT does not currently analyze or forecast information services in this market sector.

EXHIBIT A-10

Industry Sector Definitions

Industry Sector	SIC Code	Description
Discrete Manufacturing	23xx	Apparel and other finished products
	25xx	Furniture and fixtures
	27xx	Printing, publishing and allied industries
	31xx	Leather and leather products
	34xx	Fabricated metal products, except machinery and transportation equipment
	35xx	Industrial and commercial machinery and computer equipment
	36xx	Electronic and other electrical equipment and components, except computer equipment
	37xx	Transportation equipment
	38xx	Instruments; photo/med/optical goods; watches/clocks
	39xx	Miscellaneous manufacturing industry
Process Manufacturing	10xx	Metal mining
	12xx	Coal mining
	13xx	Oil and gas extraction
	14xx	Mining/quarrying nonmetallic minerals
	20xx	Food and kindred products
	21xx	Tobacco products
	22xx	Textile mill products
	24xx	Lumber and wood products, except furniture
	26xx	Paper and allied products
	28xx	Chemicals and allied products
	29xx	Petroleum refining and related industries
	30xx	Rubber and miscellaneous plastic products
	32xx	Stone, clay, glass and concrete products
	33xx	Primary metal industries
Transportation Services	40xx	Railroad transport
	41xx	Public transit/transport
	42xx	Motor freight transport/warehousing
	43xx	U.S. Postal Service
	44xx	Water transportation
	45xx	Air transportation (including airline reservation services in 4512)
	46xx	Pipelines, except natural gas
	47xx	Transportation services (including 472x, arrangement of passenger transportation)

EXHIBIT A-10 (CONT.)

Industry Sector Definitions

Industry Sector	SIC Code	Description
Telecommunications	48xx	Communications
Utilities	49xx	Electric, gas and sanitary services
Retail Distribution	52xx 53xx 54xx 55xx 56xx 57xx 58xx 59xx	Building materials General merchandise stores Food stores Automotive dealers, gas stations Apparel and accessory stores Home furniture, furnishings and accessory stores Eating and drinking places Miscellaneous retail
Wholesale Distribution	50xx 51xx	Wholesale trade - durable goods Wholesale trade - nondurable goods
Banking and Finance	60xx 61xx 62xx 67xx	Depository institutions Nondepository institutions Security and commodity brokers, dealers, exchanges and services Holding and other investment offices
Insurance	63xx 64xx	Insurance carriers Insurance agents, brokers and services
Health Services	80xx	Health services
Education	82xx	Educational services

EXHIBIT A-10 (CONT.)

Industry Sector Definitions

Industry Sector	SIC Code	Description
Business Services	65xx	Real estate
	70xx	Hotels, rooming houses, camps, and other lodging places
	72xx	Personal services
	73xx	Business services (except hotel reservation services in 7389)
	7389x	Hotel reservation services
	75xx	Automotive repair, services and parking
	76xx	Miscellaneous repair services
	78xx	Motion pictures
	79xx	Amusement and recreation services
	81xx	Legal services
	83xx	Social services
	84xx	Museums, art galleries, and botanical/zoological gardens
	86xx	Membership organizations
	87xx	Engineering, accounting, research, management, and related services
	89xx	Miscellaneous services
Federal Government	9xxx	
State and Local Government	9xxx	
Miscellaneous Industries	01xx	Agricultural production - crops
	02xx	Agricultural production - livestock/animals
	07xx	Agricultural services
	08xx	Forestry
	09xx	Fishing, hunting and trapping
	15xx	Building construction - general contractors, operative builders
	16xx	Heavy construction - contractors
	17xx	Construction - special trade contractors

2. Cross-Industry Sector Definitions

INPUT has identified seven cross-industry market sectors. These sectors or markets involve multi-industry applications such as human resource systems, accounting systems, etc.

- In order to be included in an industry sector, the service or product delivered must be specific to that sector only. If a service or product is used in more than one industry sector, it is counted as cross-industry.
- INPUT only includes the turnkey systems, applications software products, and transaction processing services in the cross-industry sectors.

The seven cross-industry markets are:

Accounting - consists of applications software products and information services that serve such functions as:

- General ledger
 - Financial management
 - Accounts payable
 - Accounts receivable
 - Billing/invoicing
 - Fixed assets
 - International accounting
 - Purchasing
 - Taxation
 - Financial consolidation
- Excluded are accounting products and services directed to a specific industry, such as tax processing services for CPAs and accountants within the business services industry sector.

Human Resources - consists of application solutions purchased by multiple industry sectors to serve the functions of human resources management and payroll. Examples of specific applications within these two major functions are:

- Employee relations
- Benefits administration
- Government compliance
- Manpower planning
- Compensation administration
- Applicant tracking
- Position control
- Payroll processing

Education and Training - consists of education and training for information systems professionals and users of information systems delivered as a software product, turnkey system or through processing services. The market for computer-based training tools for the training of any employee on any subject is also included.

Office Systems consists of the following:

- Integrated office systems (IOS)
 - Word processing
 - Desktop publishing
 - Electronic publishing
 - Image systems
- IOSs—such as IBM's OfficeVision, HP's NewWave Office and DEC's All-In-1—typically include the following core functions, all of which are accessed from the same desktop: electronic mail, decision support systems, time management and filing systems.
 - Office systems graphics include presentation graphics (which represent the bulk of office systems graphics), paint and line art, page description languages, and electronic form programs.
 - The fundamental difference between electronic publishing and desktop publishing (within the office systems sector) is that electronic publishing encompasses a method of document management and control from a single point—regardless of how many authors/locations work on a document—whereas desktop publishing is a personal productivity tool and is generally a lower end product residing on a personal computer.
 - Electronic or computer publishing systems that are sold strictly and specifically to commercial publishers, printers, and typesetters are excluded from cross-industry consideration and are included in the discrete manufacturing industry.

Engineering and Scientific encompasses the following applications:

- Computer-aided design and engineering (CAD and CAE)
 - Structural analysis
 - Statistics/mathematics/operations research
 - Mapping/GIS
- Computer-aided manufacturing (CAM) or CAD that is integrated with CAM is excluded from the cross-industry sector as it is specific to the manufacturing industries. CAD or CAE that is dedicated to integrated circuit design is also excluded because it is specific to the semiconductor industry.

Planning and Analysis consists of software products and information services in four application areas:

- Executive Information Systems (EIS)
- Financial modeling or planning systems
- Spreadsheets
- Project management

Other encompasses marketing/sales and electronic publishing application solutions.

- Sales and marketing includes:
 - Sales analysis
 - Marketing management
 - Demographic market planning models

3. Delivery Mode Reporting by Sector

This section describes how the delivery mode forecasts relate to the market sector forecasts. Exhibit A-11 summarizes the relationships.

- *Processing services* - The transaction processing services submode is forecasted for each industry and cross-industry market sector. The utility and other processing services submodes are forecasted in total market in the general market sector.
- *Turnkey systems* - Turnkey systems is forecasted for the 15 industry and 7 cross-industry sectors. Each component of turnkey systems is forecasted in each sector.
- *Applications software products* - The applications software products delivery mode is forecasted for the 15 industry and 7 cross-industry sectors. In addition, each forecast is broken down by platform level: mainframe, minicomputer and workstation/PC.
- *Systems operations* - Each of the systems operations submodes is forecasted for each of the 15 industry sectors.
- *Systems integration* - Systems integration and each of the components of systems integration are forecasted for each of the 15 industry sectors.
- *Professional services* - Professional services and each of the submodes is forecasted for each of the 15 industry sectors.

EXHIBIT A-11

Delivery Mode versus Market Sector Forecast Content

Delivery Mode	Submode	Market Sectors		
		Industry Sectors	Cross-Industry Sectors	General
Processing Services	Transaction Utility Other	X	X	X X
Turnkey Systems		X	X	
Applications Software Products		X	X	
Systems Operations	Platform Applications	X X		
Systems Integration		X		
Professional Services		X		
Network Services	Network Applications Electronic Information Services	X X		X
Systems Software Products				X
Equipment Services				X

- *Network services* - The network applications submode of network services forecasted for each of the 15 industry sectors.

Industry and cross-industry electronic information services are forecast in relevant market sectors. The remainder of electronic information services is forecasted in total for the general market sector.

- *Systems software products* - Systems software products and its submodes are forecasted in total for the general market sector. Each submode forecast is broken down by platform level: mainframe, mini-computer and workstation/PC.

- *Equipment services* - Equipment services and its submodes are forecasted in total in the general market sectors.

F

Vendor Revenue and User Expenditure Conversion

The size of the information services market may be viewed from two perspectives: vendor (producer) revenues and user expenditures. INPUT defines and forecasts the information services market in terms of user expenditures. User expenditures reflect the markup in producer sales when a product such as software is delivered through indirect distribution channels (such as original equipment manufacturers (OEMs), retailers and distributors). The focus on user expenditure also eliminates the double counting of revenues that would occur if sales were tabulated for both producer (e.g., Lotus) and distributor (e.g., ComputerLand).

For most delivery modes, vendor revenues and user expenditures are fairly close. However, there are some areas of significant difference. Many microcomputer software products, for example, are marketed through distribution channels. To capture the value added through these distribution channels, adjustment factors are used to convert estimated information services vendor revenues to user expenditures.

For some delivery modes, including software products, systems integration and turnkey systems, there is a significant volume of intra-industry sales. For example, systems integrators purchase software and subcontract the services of other professional services vendors. Turnkey vendors incorporate purchased software into the systems they sell to users.

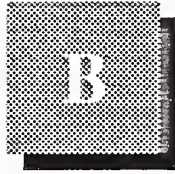
To account for such intra-industry transactions, INPUT uses conversion ratios to derive the estimate of end-user expenditures.

Exhibit A-12 summarizes the net effect of the various ratios used by INPUT to convert vendor revenues to user expenditure (market size) figures for each delivery mode.

EXHIBIT A-12

**Vendor Revenue to
User Expenditure Conversion**

Delivery Mode	Vendor Revenue Multiplier
Applications Software Products	1.18
Systems Software Products	1.10
Systems Operations	0.95
Systems Integration	0.95
Professional Services	0.99
Network Services	0.99
Processing Services	0.99
Turnkey Systems	0.95
Equipment Services	0.99



Systems Integration Forecast Data Base, 1992-1997

EXHIBIT B-1

Systems Integration Forecast Data Base Banking and Finance

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	120	315
Communications Equipment	70	175
Applications Software Packages	25	70
Systems Software Packages	10	25
Consulting Services	25	70
Project Management Fees	25	65
Design/Integration	50	135
Software Development	130	340
Education/Training	15	35
Operations and Maintenance	15	35
Other Expenditures	25	70
Total SI Expenditures	520	1,340

Total CAGR = 21%

Note: Totals may not add due to rounding.

EXHIBIT B-2

Systems Integration Forecast Data Base Discrete Manufacturing

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	370	975
Communications Equipment	95	250
Applications Software Packages	70	185
Systems Software Packages	30	70
Consulting Services	70	185
Project Management Fees	65	170
Design/Integration	135	360
Software Development	400	1,045
Education/Training	30	80
Operations and Maintenance	35	90
Other Expenditures	40	115
Total SI Expenditures	1,350	3,540

Total CAGR = 21%

Note: Totals may not add due to rounding.

EXHIBIT B-3

Systems Integration Forecast Data Base Education Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	25	60
Communications Equipment	10	25
Applications Software Packages	5	10
Systems Software Packages	5	10
Consulting Services	5	15
Project Management Fees	5	10
Design/Integration	10	25
Software Development	35	70
Education/Training	2	5
Operations and Maintenance	5	10
Other Expenditures	2	5
Total SI Expenditures	105	235

Total CAGR = 17%

Note: Totals may not add due to rounding.

EXHIBIT B-4

Systems Integration Forecast Data Base Insurance Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	30	60
Communications Equipment	10	30
Applications Software Packages	15	40
Systems Software Packages	5	10
Consulting Services	15	35
Project Management Fees	10	30
Design/Integration	30	70
Software Development	80	195
Education/Training	10	20
Operations and Maintenance	10	20
Other Expenditures	5	10
Total SI Expenditures	220	525

Total CAGR = 19%

Note: Totals may not add due to rounding.

EXHIBIT B-5

Systems Integration Forecast Data Base Health Services Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	80	135
Communications Equipment	20	40
Applications Software Packages	20	30
Systems Software Packages	10	15
Consulting Services	10	20
Project Management Fees	15	25
Design/Integration	20	40
Software Development	80	130
Education/Training	10	15
Operations and Maintenance	10	15
Other Expenditures	10	15
Total SI Expenditures	285	480

Total CAGR = 11%

Note: Totals may not add due to rounding.

EXHIBIT B-6

Systems Integration Forecast Data Base Process Manufacturing Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	115	220
Communications Equipment	40	80
Applications Software Packages	10	20
Systems Software Packages	10	20
Consulting Services	15	30
Project Management Fees	15	30
Design/Integration	25	50
Software Development	90	180
Education/Training	10	20
Operations and Maintenance	10	20
Other Expenditures	10	20
Total SI Expenditures	350	690

Total CAGR = 14%

Note: Totals may not add due to rounding.

EXHIBIT B-7

Systems Integration Forecast Data Base Retail Distribution Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	80	200
Communications Equipment	40	110
Applications Software Packages	15	45
Systems Software Packages	5	20
Consulting Services	15	45
Project Management Fees	15	40
Design/Integration	35	90
Software Development	90	225
Education/Training	10	20
Operations and Maintenance	10	20
Other Expenditures	15	40
Total SI Expenditures	330	855

Total CAGR = 21%

Note: Totals may not add due to rounding.

EXHIBIT B-8

Systems Integration Forecast Data Base State and Local Government

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	270	700
Communications Equipment	80	210
Applications Software Packages	30	75
Systems Software Packages	30	75
Consulting Services	55	145
Project Management Fees	55	140
Design/Integration	75	195
Software Development	260	675
Education/Training	25	65
Operations and Maintenance	15	40
Other Expenditures	25	65
Total SI Expenditures	920	2,380

Total CAGR = 21%

Note: Totals may not add due to rounding.

EXHIBIT B-9

Systems Integration Forecast Data Base Telecommunications Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	55	140
Communications Equipment	20	50
Applications Software Packages	10	25
Systems Software Packages	5	20
Consulting Services	15	45
Project Management Fees	10	30
Design/Integration	25	60
Software Development	80	210
Education/Training	5	15
Operations and Maintenance	5	20
Other Expenditures	5	5
Total SI Expenditures	235	620

Total CAGR = 21%

Note: Totals may not add due to rounding.

EXHIBIT B-10

Systems Integration Forecast Data Base Transportation Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	45	120
Communications Equipment	25	65
Applications Software Packages	10	20
Systems Software Packages	5	10
Consulting Services	10	30
Project Management Fees	10	25
Design/Integration	20	45
Software Development	60	150
Education/Training	5	10
Operations and Maintenance	5	10
Other Expenditures	5	15
Total SI Expenditures	200	500

Total CAGR = 21%

Note: Totals may not add due to rounding.

EXHIBIT B-11

Systems Integration Forecast Data Base Utilities Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	175	310
Communications Equipment	40	70
Applications Software Packages	35	60
Systems Software Packages	20	30
Consulting Services	30	50
Project Management Fees	30	50
Design/Integration	40	70
Software Development	160	280
Education/Training	15	30
Operations and Maintenance	10	20
Other Expenditures	25	45
Total SI Expenditures	580	1,015

Total CAGR = 12%

Note: Totals may not add due to rounding.

EXHIBIT B-12

Systems Integration Forecast Data Base Wholesale Distribution Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	45	95
Communications Equipment	20	40
Applications Software Packages	5	15
Systems Software Packages	5	10
Consulting Services	10	20
Project Management Fees	10	20
Design/Integration	20	40
Software Development	55	115
Education/Training	5	10
Operations and Maintenance	5	10
Other Expenditures	5	10
Total SI Expenditures	180	385

Total CAGR = 16%

Note: Totals may not add due to rounding.

EXHIBIT B-13

Systems Integration Forecast Data Base Business Services Industry

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	45	130
Communications Equipment	25	70
Applications Software Packages	20	60
Systems Software Packages	5	10
Consulting Services	10	30
Project Management Fees	10	25
Design/Integration	20	55
Software Development	40	115
Education/Training	5	15
Operations and Maintenance	5	15
Other Expenditures	10	25
Total SI Expenditures	190	540

Total CAGR = 24%

Note: Totals may not add due to rounding.

EXHIBIT B-14

Systems Integration Forecast Data Base Federal Government

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	1,350	2,355
Communications Equipment	410	710
Applications Software Packages	120	210
Systems Software Packages	120	210
Consulting Services	180	310
Project Management Fees	170	295
Design/Integration	240	415
Software Development	825	1440
Education/Training	80	135
Operations and Maintenance	50	90
Other Expenditures	155	270
Total SI Expenditures	3,690	6,440

Total CAGR = 12%

Note: Totals may not add due to rounding.

EXHIBIT B-15

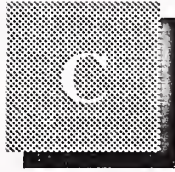
Systems Integration Forecast Data Base All Industries

SI Component	Market Size (\$ Millions)	
	1992	1997
Information Systems Equipment	2,830	5,870
Communications Equipment	920	1,950
Applications Software Packages	390	860
Systems Software Packages	260	840
Consulting Services	470	1,015
Project Management Fees	440	945
Design/Integration	735	1,625
Software Development	2,360	5,120
Education/Training	220	475
Operations and Maintenance	180	405
Other Expenditures	340	710
Total SI Expenditures	9,140	19,510

Total CAGR = 16%

Note: Totals may not add due to rounding.

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1992 Systems Integration Data Base Reconciliation

The systems integration markets, both commercial and federal, were affected by a number of forces since the 1991 INPUT forecast. This appendix compares the forecasts for the fifteen vertical markets for two specific years, 1991 and 1996.

The comparison appears in Exhibit C-1 at the end of this text. There are several key points to note.

- All INPUT forecasts are presented in current dollars. Thus, reduced inflation results in a corresponding reduction in the forecast.
- Overall, the SI market was increased 3% in the short term but reduced by 4% in 1997. The long-term forecast was most heavily influenced by a decrease in the growth of the federal government industry sector.
- Although poor economic conditions have had an impact, the commercial systems integration market has met expectations. The market remains very sensitive to the economy. If the forecasted recovery does not occur or conditions worsen, opportunities for CSI programs will decrease substantially.

The discrete manufacturing industry growth rate has slowed slightly due to the sluggish economy. Information systems executives have projects that they would like to initiate, but they are unable to obtain the funding necessary to begin.

A re-evaluation of the process manufacturing industry has led to a substantial upward revision of the market size. Conversely the growth rate has been reduced from 18% to 13%.

The banking/finance industry is adapting to operating in a stagnant economy. Very high real long-term interest rates and bank card interest rates are offsetting losses caused by non-performing loans. Many SI programs are to consolidate numerous separate systems and create centralized data bases with networked access. Some SI opportunities have been lost to the trend to outsource the entire IS department.

Results for the telecommunications industry show a small increase in the market size and growth rate. The need for SI is being driven by increased industry competition.

The poor economy and slow consumer spending continues to affect the retail industry. In the short term, mergers and bankruptcies will reduce the number of companies and establishments. This industry will continue to be very sensitive to economic conditions.

Like the retail industry, wholesalers are feeling the impact of reduced consumer spending. The industry is being squeezed by competition from retailers on one end and manufacturers on the other. While the 1991 forecast has remained the same, outlook through 1996 is a continued decline. This again is a projection of caution by the wholesale community.

In the insurance industry, continuing cost pressures reduce the anticipated level of systems development expenditures, and this, combined with a continued preference for in-house control of systems activities, reduced the projected market size.

Like insurance, the health services industry is experiencing continued cost pressures and is reducing anticipated levels of systems development expenditures. It also has demonstrated continued preference for in-house control of systems activities. These two factors combined maintain the projected CAGR somewhat further at 11%.

Education industry SI spending growth projections are forecasted to remain constant. Education tends to be at the end of the public spending chain and when public sector budgets are tight and consumer spending off, little is left over for educational institutions. While the overall decline would suggest a lower rate of growth, the overall growth rate has not been reduced significantly owing to the government's expressed renewed interests in education. Whether this will come to pass remains to be seen.

The state and local government market increases from 21% to 25%. The impact of budget cuts continue to be felt, but state and local governments recognize increasingly that systems are needed to offset reductions in hiring coupled with increased demands. The federal government is shifting some program responsibilities to the states and partially funding the IS requirements. Compared to other industry segments, state and local governments are especially lacking in technically skilled personnel.

Although the short-term potential for federal government SI has remained constant, the long-term potential has been reduced. Consolidation within DoD, budget deficits, and shifting priorities from defense to civilian agencies have all contributed to a reduction in the forecasted CAGR from 16% down to 12%.

EXHIBIT C-1

1992 Systems Integration Data Base Reconciliation by Industry Sector

Industry Sector	1991 Market				1996 Market				91-96 CAGR per data 92 rpt (%)	91-96 CAGR per data 92 rpt (%)
	1991 Report (Fcst) (\$M)	1992 Report (Actual) (\$M)	Variance from 1991 Report		1991 Report (Fcst) (\$M)	1992 Report (Fcst) (\$M)	Variance from 1991 Report			
			(\$M)	(%)			(\$M)	(%)		
Discrete Manufacturing	1,135	1,135	0	0	3,040	2,915	-125	-4	22	21
Process Manufacturing	170	325	155	91	390	595	205	53	18	13
Transportation	165	165	0	0	410	410	0	0	20	20
Utilities	510	510	0	0	915	915	0	0	12	12
Telecommunications	200	200	0	0	490	505	15	3	19	20
Retail Distribution	270	270	0	0	705	705	0	0	21	21
Wholesale Distribution	155	155	0	0	330	330	0	0	16	16
Banking and Finance	405	480	75	19	1,020	1,045	25	2	20	17
Insurance	210	200	-10	-5	480	440	-40	-8	18	17
Health Services	250	250	0	0	420	420	0	0	11	11
Education	90	90	0	0	200	200	0	0	17	17
State and Local Gov't.	640	640	0	0	1,645	1,970	325	20	21	25
Federal Government	3,320	3,320	0	0	6,900	5,760	-1,140	-17	16	12
Business Services	150	150	0	0	440	440	0	0	24	24
Total	7,680	7,890	210	3	17,385	16,650	-735	-4	18	16

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